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Compilation of THESIS ABSTRACTS

December 2011



Office of the Vice President and Dean of Research
Naval Postgraduate School

PREFACE

This publication contains abstracts of unrestricted theses submitted for the degrees doctor of philosophy, master of business administration, master of science, and master of arts for the December 2011 graduation.

This compilation of abstracts of theses is published in order that those interested in the fields represented may have an opportunity to become acquainted with the nature and substance of the student research that has been undertaken. Copies of theses are available for those wishing more detailed information. The procedure for obtaining copies is outlined on the last page of this volume.

For additional information on programs, or for a catalog, from the Naval Postgraduate School, contact the director of admissions.

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Summary of Research, an annual compilation of research projects and publications, is also available online, at <http://www.nps.edu/Research/SummaryRes.html>. Research News, a monthly newsletter highlighting NPS research, can be found at <http://www.nps.edu/Research/Newsletters.html>.

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INTRODUCTION

Mission

The Naval Postgraduate School (NPS) was established to serve the advanced educational needs of the Navy. The broad responsibility of the school is reflected in its stated mission:

Increase the combat effectiveness of U.S. and allied armed forces and enhance the security of the United States of America through advanced education and research programs focused on the technical, analytical, and managerial tools needed to confront defense-related challenges of the future.

To fulfill its mission, the Naval Postgraduate School strives to sustain excellence in the quality of its instructional programs, to be responsive to technological change and innovation in the Navy, and to prepare officers to introduce and utilize future technologies.

The research program at NPS exists to support the primary mission of graduate education. Research at NPS:

- maintains upper-division course content and programs at cutting edge;
- challenges students with creative problem solving experiences on DoD-relevant issues;
- advances DoN/DoD technology;
- solves warfare problems; and
- attracts and retains quality faculty.

Academic Programs

To meet its educational requirements, the Navy has developed a unique academic institution at the Naval Postgraduate School through the use of specially tailored academic programs, and a distinctive organization tying academic disciplines to naval and joint warfighting applications.

The Naval Postgraduate School has aligned its education and supporting research programs to achieve three major goals: 1) academic programs that are nationally recognized and support the current and future operations of the Navy and Marine Corps, our sister services, and our allies; 2) research programs that focus on the integration of education and research in support of current and emerging national security technologies and operations, and of

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INTRODUCTION

education and research in support of current and emerging national security technologies and operations, and 3) executive and continuing education programs that support continuous intellectual innovation and growth throughout an officer's career. Programs of graduate studies at NPS are grouped as follows:

Graduate School of Operational and Information Sciences

- Computer Science
- Computer Technology
- Electronic Warfare Systems
- Human Systems Integration
- Information Sciences
- Information Systems and Operations
- Information Systems and Technology
- Information Warfare
- Joint C4I Systems
- Joint Information Operations
- Modeling, Virtual Environments, and Simulation
- Operations Analysis
- Operational Logistics, Joint
- Software Engineering
- Special Operations and Irregular Warfare
- Systems Analysis

Graduate School of Engineering and Applied Sciences

- Applied Mathematics
- Combat Systems Science and Technology
- Electronic Systems Engineering
- Meteorology
- Meteorology and Oceanography
- Naval/Mechanical Engineering
- Oceanography
- Operational Oceanography
- Reactors—Mechanical/Electrical Engineering
- Space Systems Engineering
- Space Systems Operations
- Systems Engineering
- Systems Engineering Management
- Undersea Warfare
- Underwater Acoustic Systems

Graduate School of Business and Public Policy

- Acquisition and Contract Management
- Contract Management
- Executive Management
- Executive Master of Business Administration
- Financial Management
- Information Systems Management
- Defense Business Management
- Defense Systems Analysis
- Defense Systems Management, International
- Material Logistics Support
- Manpower Systems Analysis
- Program Management
- Resource Planning and Management for International Defense
- Supply Chain Management
- Systems Acquisition Management
- Transportation Management

School of International Graduate Studies

- Civil–Military Relations
- Combating Terrorism: Policy, Strategy
- Defense Decision Making and Planning
- Homeland Security and Defense
- Security Studies
- Stabilization and Reconstruction
- National Security and Intelligence:
 - Middle East, South Asia, Sub-Saharan Africa
 - Far East, Southeast Asia, Pacific
 - Europe and Eurasia
 - Western Hemisphere

The student body consists of U.S. officers from all branches of the uniformed services, civilian employees of the federal government, and foreign military officers and government civilians. The resident degree/sub-specialty student population for December 2011 is shown in Figure 1 on the following page.

INTRODUCTION

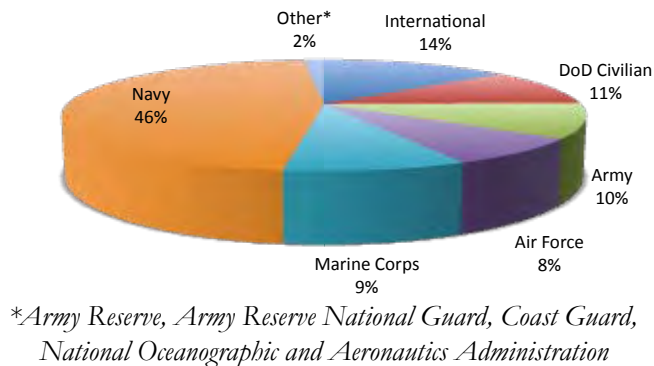


Figure 1: Resident Degrees/Subspecialty Student Population for December 2011 (1,672 total)

Academic Degrees

Curricula meet defense requirements within the traditional degree framework. All curricula lead to a master's; additional study may yield an engineer's or doctoral degree. Below is a listing of the degrees offered at NPS:

Master of Arts

- Security Studies

Master of Business Administration

Master of Science

- Applied Mathematics
- Applied Physics
- Applied Science
- Astronautical Engineering
- Combat Systems Technology
- Computer Science
- Computing Technology
- Contract Management
- Cost Estimation and Analysis
- Defense Analysis
- Electrical Engineering
- Electronic Warfare Systems Engineering
- Engineering Acoustics
- Engineering Science
- Engineering Systems
- Human Systems Integration
- Information Operations
- Information Systems and Operations
- Information Technology Management
- Information Warfare Systems Engineering
- Management
- Mechanical Engineering
- Meteorology
- Meteorology and Physical Oceanography
- Modeling, Virtual Environments, and Simulation
- Operations Research
- Physical Oceanography

- Physics
- Product Development
- Program Management
- Remote-Sensing Intelligence
- Software Engineering
- Space Systems Operations
- Systems Analysis
- Systems Engineering
- Systems Engineering Analysis
- Systems Engineering Management
- Systems Technology

Engineer

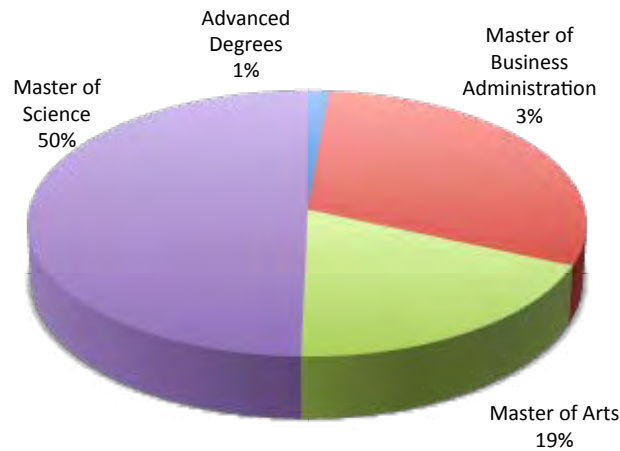
- Astronautical Engineer
- Electrical Engineer
- Mechanical Engineer

Doctor of Philosophy

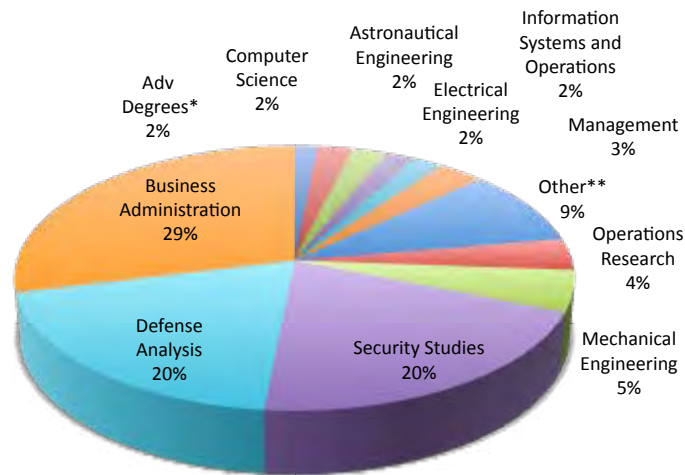
- Applied Mathematics
- Applied Physics
- Astronautical Engineering
- Computer Science
- Electrical Engineering
- Engineering Acoustics
- Information Sciences
- Mechanical Engineering
- Meteorology
- Modeling, Virtual Environments, and Simulation
- Operations Research
- Physical Oceanography
- Physics
- Security Studies
- Software Engineering

INTRODUCTION

In December 2011, 284 degrees were conferred. Figure 2 indicates distribution by type, Figure 3 by degree area.



**Figure 2. Distribution by Degree Type
(284 Degrees Conferred)**



* *Advanced degrees: computer science (1), astronautical engineering (1), meteorology (1), electrical engineer (1)*

***Other master's degrees: applied mathematics (1), applied physics (5), engineering science (1), information sciences (1), information technology management (2), physics (3), program management (3), space systems operations (3), contract management (5), combat systems technology (4)*

**Figure 3. Degrees Conferred in December 2011
(284 Degrees Conferred)**

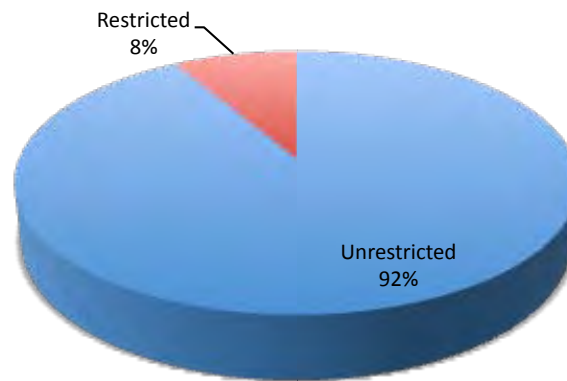
INTRODUCTION

Theses

The thesis is the capstone of the student's academic endeavor at NPS. Thesis topics address issues ranging from the current needs of the fleet and joint forces to the science and technology that is required to sustain long-term superiority of the Navy/DoD.

Aided by faculty advisors, NPS students represent a vital resource within the DoD for addressing warfighting problems, one especially important at present, when technology in general, and information operations in particular, is changing rapidly. Our officers think innovatively and possess the knowledge and skill to apply nascent technologies in the commercial and military sectors. Their firsthand grasp of operations, when combined with a challenging thesis project that requires them to apply their focused graduate education, is one of the most effective elements in solving fleet/joint-force problems. NPS graduate education encourages a lifelong capacity for applying basic principles to the creative solution of complex problems.

NPS is unique in its ability to conduct classified research. Restricted theses are available on the NPS SIPRNET.



**Figure 4. Classification of Theses
(284 Degrees Conferred)**

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ADVANCED DEGREES

Doctor of Philosophy
Engineer

DOCTOR OF PHILOSOPHY

DEFINING AND ENFORCING HARDWARE SECURITY REQUIREMENTS

Michael B. Bilzor—Commander, United States Navy

B.S., U.S. Naval Academy, 1992

M.S., Johns Hopkins University, June 1993

Doctor of Philosophy in Computer Science—December 2011

Advisor: Ted Huffmire, Department of Computer Science

Security in computing systems to date has focused mostly on software. In this research, we explore the application and enforceability of well-defined security requirements in hardware designs. The principal threats to hardware systems demonstrated in the academic literature to date involve some type of subversion, often called a Hardware Trojan or malicious inclusion. Detecting these has proved very difficult.

We demonstrate a method whereby the dynamic enforcement of a processor's security requirements can be used to detect the presence of some of these malicious inclusions. Although there are theoretical limits on what security properties can be dynamically enforced using the techniques we describe, our research does provide a novel method for expressing and enforcing security requirements at runtime in hardware designs. While the method does not guarantee the detection of all possible malicious inclusions in a given processor, it addresses a large class of inclusions -- those detectable as violations of behavioral restrictions in the architectural specification—which provides significant progress against the general case, given a suitably complete set of checkers.

KEYWORDS: processor, security, assertion, temporal logic, PSL, hardware, HDL, Verilog, VHDL, checker-generator, automata.

OPTIMAL CONTROL OF SHOCK WAVE ATTENUATION IN SINGLE- AND TWO-PHASE FLOW WITH APPLICATION TO IGNITION OVERPRESSURE IN LAUNCH VEHICLES

Nathan D. Moshman—DoD Civilian

B.S., University of California, Santa Barbara, 2006

M.S., University of California, San Diego, 2008

Doctor of Philosophy in Aerospace Engineering—December 2011

Advisor: S. S. Sritharan, Center for Decision, Risk, Controls & Signals intelligence

NASA and private launch providers have a need to understand and control ignition overpressure blast waves that are generated by a solid grain rocket during ignition. Research in accurate computational fluid dynamics prediction of the launch environment is underway. A clearer picture is emerging from empirical data which more precisely categorizes all the dissipative mechanisms present in droplet-shock interactions. In this dissertation, water droplets and their effects due to vaporization are represented as a control action and two new optimal control problems are formulated concerning unsteady shock wave attenuation. A single-phase control problem is formulated by representing the effect of droplet vaporization as an energy sink on the right hand side of the unsteady Euler equations in one dimension. Results for the optimal distribution of equivalent mass of water vaporized for a given level of attenuation are presented. A two-phase control problem consists of solving for the initial optimal water droplet distribution. Results are presented for constrained and unconstrained water volume fraction distributions over increasing levels of attenuation. New adjoint-based algorithms were

constructed which leave the final time free and satisfy all first order necessary conditions as well as avoid taking a variation at the shock front.

KEYWORDS: Multiphase Flow, Droplet-Shock Interactions, CFD for compressible multi-phase flows, Ignition Overpressure, sparse non-linear programming, adjoint-based control algorithms, optimal control of PDEs, unsteady shock attenuation

**AN OBSERVATIONAL STUDY OF TROPICAL CYCLONE SPIN-UP IN
SUPERTYPHOON JANGMI AND HURRICANE GEORGES**

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M.H.R., University of Oklahoma, August 1997

M.S., Texas A&M University, August 1999

Doctor of Philosophy in Meteorology, December 2011

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An observational study of tropical cyclone spin-up is performed using dropsondes and satellite imagery from Supertyphoon Jangmi and Hurricane Georges. A gradient wind analysis is conducted also for both storms and ELDORA data are analyzed in Tropical Storm Jangmi. The dropsonde analysis shows that the peak tangential wind occurs persistently within the boundary layer and suggests that significant supergradient winds are present there. However, as a result of data limitations arising from asymmetries and irregular placement of dropsondes in both time and space, a strongly conclusive statement about the presence of supergradient winds in Tropical Storm Jangmi is not possible. A dense deployment of dropsondes across the radius of maximum wind is recommended to resolve the pressure gradient with sufficient accuracy to validate that supergradient winds exist at the tropical storm stage. An examination of ELDORA data in Tropical Storm Jangmi indicates that multiple rotating updrafts are present near the eye underneath cold cloud tops of $\leq -65^{\circ}\text{C}$. In particular, there is a 12 km-wide, upright, updraft of 9 m s^{-1} with co-located strong low-level ($z < 2 \text{ km}$) convergence of $2 \times 10^{-3} \text{ s}^{-1}$ and intense relative vorticity values $4 \times 10^{-3} \text{ s}^{-1}$. From these results, it is surmised that cold cloud tops in a rotating storm are an indicator of rotating deep convection below. Analysis of the infrared satellite imagery of both storms suggests that rotating updrafts are omnipresent before and during rapid intensification. The findings of this study support a new theoretical model positing that spin-up of the maximum winds occurs within the boundary layer and rotating deep convective cells are predominant during tropical cyclone intensification.

KEYWORDS: Tropical-cyclone spin-up, vortical hot towers, Supertyphoon Jangmi, Hurricane Georges, tropical-cyclone intensification, rapid intensification, rotating deep convection, tropical-cyclone boundary layer

ELECTRICAL ENGINEER

SOURCE LOCALIZATION IN A COGNITIVE RADIO ENVIRONMENT CONSISTING OF FREQUENCY AND SPATIAL MOBILITY

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Electrical Engineer—December 2011

Master of Science in Electrical Engineering—December 2011

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Second Reader: Frank E. Kragh, Department of Electrical and Computer Engineering

Cognitive radio presents a unique challenge to source localization in that the radio has the ability to adapt to the environment, thus rendering current localization techniques ineffective due to a shifting combination of spatial, frequency, and temporal parameters. For any localization scheme to be effective, it must be able to adapt over time as a cognitive radio adapts to its surroundings. In this thesis an extended semi range-based localization scheme is proposed to accomplish this task. The proposed scheme estimates the position of a cognitive radio using the collaborative spectrum sensing results of a wireless radio frequency sensor network in a cognitive radio environment. The central idea behind the proposed scheme is to exploit the relationships between spatial, frequency, and temporal parameters of the environment to solve for the position of the cognitive radio. The proposed scheme is modeled in the MATLAB programming language, and its efficacy is demonstrated through simulation. It is shown that over time the proposed scheme is capable of estimating the frequency band of operation and the location of a cognitive radio, and is thus capable of accounting for both frequency and spatial mobility inherent in the cognitive radio environment.

KEYWORDS: Cognitive Radio, Source Localization, Semi Range-Based Localization, Mobile Positioning, Wireless Sensor Networking

MASTER OF BUSINESS ADMINISTRATION

ANALYSIS OF UNITED STATES AIR FORCES CENTRAL GOVERNMENT PURCHASE CARD REACHBACK VIABILITY

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Master of Business Administration—December 2011

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This project investigates the viability of performing United States Air Forces Central (USAFCENT) government purchase card (GPC) purchases by utilizing reachback services. The study analyzed FY 2011 data to include the number of deployed contingency contracting officers (CCOs), GPC actions, and total contract actions at each Expeditionary Contracting Squadron. Using this data, models were developed that showed potential reductions in deployed CCOs if GPC actions were sent from USAFCENT area of responsibility to a stateside reachback cell.

The study provides recommendations based on the potential reductions of deployed CCOs. One such recommendation is to stand up a test reachback cell. This cell will employ the recommended number of personnel developed by the models in this project.

KEYWORDS: Reachback, GPC, USAFCENT, contingency, contracting, expeditionary, reach, back

OPERATING AND SUPPORT COSTS AND AFFORDABILITY OF A 324-SHIP, NAVAL BATTLE FORCE

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Master of Business Administration—December 2011

First Advisor: Daniel Nussbaum, Department of Operations Research

Second Advisor: CAPT John Mutty, USN (Ret.), Graduate School of Business and Public Policy

The purpose of this research was to determine both the added operating and support (O&S) costs and affordability of operating and maintaining a future naval battle force of 324 ships as proposed in the Navy's thirty-year shipbuilding plan. Cost estimation including regression, 3-year moving averages, point, expert and analogous modeling was used to capture both historical and future O&S costs from FY1991 to FY2024.

With an emphasis on the three main cost drivers, (manpower, fuel and maintenance) which arguably had the largest influence on ships' O&S costs, data were obtained from the visibility & management of operating and support cost (VAMOSC) database and various selected acquisition reports (SARs). Analysis and modeling followed suite in order to forecast expected future costs and affordability for a proposed 12.5 percent growth in naval fleet size by FY2024.

Reviewing all twenty-nine classes of ship within the expected FY2024 battle force, normalized results from the cost estimation models yielded a minimum cost growth of 17% in O&S costs. Even if budget growth trend rates were to remain steady, negating the possibility of budget decreases, this thesis argues the Navy would still not be able to afford its proposed future battle force in FY2024.

KEYWORDS: Affordability, Battle Force, Cost Estimation, Forecasting, Maintenance

MASTER OF BUSINESS ADMINISTRATION

AIR FORCE OPERATIONAL CONTRACTING KNOWLEDGE ASSESSMENT: ANALYZING EXPLICIT AND TACIT CONTRACTING KNOWLEDGE

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Master of Business Administration—December 2011

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The Defense Acquisition Workforce Improvement Act (DAWIA) establishes education and training standards for acquisition personnel. These standards culminate into ascending levels of certification for acquisition professionals based on education, training, and experience. While the intent of DAWIA certification is to ensure acquisition professionals possess the requisite knowledge and experience to perform their duties, currently no method exists to effectively measure an individual's contracting knowledge. The Air Force Operational Contracting Knowledge Assessment (OCKA-AF) attempts to accurately assess an individual's tacit (experiential) and explicit (factual) operational contracting knowledge across the six phases of the contracting process. The assessment tool also identifies knowledge gaps between tacit and explicit knowledge. The OCKA-AF was deployed in the form of a web-based survey to two Air Force operational contracting squadrons and Air Force contracting students attending the Naval Postgraduate School. The survey results were analyzed, upon which recommendations were made to reduce existing tacit and explicit contracting knowledge gaps. Due to its knowledge assessment capability, the OCKA-AF may be beneficial to supervisors and senior contracting leadership in determining whether current training efforts are producing the desired results in knowledge capture or provide insight into areas requiring further training emphasis.

KEYWORDS: Contracting, Knowledge Assessment, Explicit Knowledge, Tacit Knowledge, Operational Contracting

AN ACQUISITION LEADER'S MODEL FOR BUILDING COLLABORATIVE CAPACITY

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This research aggregates current research to develop a three-step model for analyzing and assessing collaborative capacity, with the larger goal of improving cost, performance, and schedule for acquisition programs. The report begins by defining collaboration, and provides examples of Department of Defense (DoD) acquisition efforts where a lack of collaboration caused problems. The examples drive the main research question: "How can DoD acquisition leaders improve their collaborative capacity to improve cost, schedule and performance?" The project provides a model for addressing collaboration challenges, and a methodology for assessing areas of organization, stakeholders, relationships, and networks. Based on assessment of these challenges, the model provides methods for improving collaborative capacity, with a focus on the strategic goal of improving cost, schedule, and performance. Lastly, the model calls for execution of plans made in step two. This process is repeated until the desired collaboration capacity has been reached. A chapter of the project develops a detailed hypothetical example of how the model can be applied.

KEYWORDS: Collaboration, Collaboration Capacity, Defense Acquisition, Acquisition Leader, Program Management, Project Management

**A DECISION MODEL FOR MERGING BASE OPERATIONS: OUTSOURCING
PEST MANAGEMENT ON JOINT BASE ANACOSTIA-BOLLING**

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Master of Business Administration–December 2011

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In accordance with congressional legislation, on October 1, 2010, Bolling Air Force Base and Naval Support Facility Anacostia merged to form Joint Base Anacostia-Bolling (JBAB). The installation occupies over 900 acres and requires an extensive pesticide treatment plan. Currently, the level of service for pesticide treatment is different on Bolling than it is on Anacostia. Bolling is staffed with three full-time civil service entomologists who provide effective pesticide treatment for the 136 buildings and 359 acres of land area Bolling occupies. Anacostia has 74 buildings and 607 acres of land area in which only two buildings are fully treated under an existing regional contract. The goal of this report is to help the decision-maker choose the best course of action to meet the expanded pest management requirement among the following alternatives: 1) absorb the larger requirement with in-house capacity; 2) outsource the entire pest management and herbicide requirement to a private contractor for all of JBAB; 3) utilize contract services to meet the additional requirement (hybrid type - in-house employees augmented with contracted services); or 4) hire additional in-house personnel. The final product is a recommendation, based on a Cost-Benefit Analysis, for the best alternative to complete the pest management mission on JBAB.

KEYWORDS: Outsourcing Base Operations, Decision Model for Outsourcing Base Operations, Analysis of Alternatives when outsourcing, outsourcing decisions, outsourcing analysis, pest management on military installations, ground maintenance on military installations, joint basing, multi-sector workforce, insourcing, contractor mix.

**A COST ESTIMATION OF BIOFUEL FOR NAVAL AVIATION:
BUDGETING FOR THE GREAT GREEN FLEET**

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Master of Business Administration–December 2011

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This thesis estimates the cost of biofuel to meet the Department of the Navy's (DON) stated energy objectives, i.e., sailing the Great Green Fleet in 2016 and transitioning to 50 percent alternative fuel by 2020. The first estimate is for the additional cost to operate the Carrier Air Wing (CVW) component of the Great Green Fleet in 2016. A premium to the cost of JP-5 is estimated. A second estimate is made for a CVW operating a six month deployment with 50 percent biofuel in 2020. A premium was estimated and a sensitivity analysis was conducted to project the required reduction in costs for biofuel from 2012 estimates to reach parity pricing with petroleum fuel by 2020.

KEYWORDS: Biofuel, Alternative Fuel, Great Green Fleet, Cost Estimation, Naval Aviation, Petroleum, JP-5, Drop-in Replacement Biofuels

MASTER OF BUSINESS ADMINISTRATION

ANALYSIS OF HISTORICAL MATERIEL-RETURN PROGRAM (MRP) CREDITS AT THE 1ST MARINE LOGISTICS GROUP REPARABLE ISSUE POINT (RIP)

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Master of Science in Management—December 2011
Master of Business Administration—December 2011**

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Materiel Returns Program (MRP) credits have increased 1st Marine Logistics Group's (1st MLG) total obligation authority by an average of 27% annually since 2008. However, 1st MLG has been unable to leverage the MRP in budget execution due to an inability to forecast future credits.

The purpose of this research is to determine whether analysis of historical MRP credits at 1st MLG could enable the comptroller to forecast future credits, which would enable 1st MLG to leverage MRP credits and budget more efficiently in a constrained fiscal environment. This research utilized descriptive analysis of historical credits to identify systemic patterns or trends associated with MRP. The analysis of MRP credits focused on two specific areas: (1) the accuracy of credit estimates provided by the sources of supply (SOSs), and (2) the amount of time it took for 1st MLG to receive the actual credit.

The primary finding of this research was that 1st MLG should be able to forecast MRP credits. The research showed that historically over a two-year period, SOSs accurately estimated credits 88.3% of the time and SOSs issued 95% of all actual credits within 90 days of 1st MLG submitting an item into MRP.

KEYWORDS: Materiel Returns Program, Reparable Issue Point, Secondary Reparable, SECREP, Credit, Source of Supply, MRP, RIP, Marine Logistics Group

IS CHANGE REQUIRED? AN ECONOMIC CASE STUDY OF THE RISE AND FALL OF EMPIRES, AND WHY A NATIONAL STRATEGIC NARRATIVE COULD CHANGE THE FATE OF THE UNITED STATES EMPIRE

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Master of Business Administration—December 2011**

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Second Reader: Nicholas Dew, Graduate School of Business and Public Policy

The United States of America is for all practical purposes, an empire. It has territories separated by bodies of water that are under its control, has the world's largest economy, and it has the ability to project its force with a large and powerful military. Like other empires, the U.S. is prone to follow the historical model of an imperial rise to power and a later fall from power. I hypothesize that the United States is on the verge of a fall from preeminence. By comparing the United States with the Roman and British Empires, I intend to research the economic causes behind the collapse of these two empires and see if the United States is in a comparable situation. If the United States is falling from power, then it has two options, accept its fate, or like the Romans and British, change course and try to continue to hold onto power as long as possible. The United States can learn something by studying the successes and mistakes made by previous world powers. By studying older world powers, this thesis will attempt to compare current problems the U.S. faces to those problems that Rome and Great Britain faced in their respective eras. This thesis will use these two historical case studies to find solutions to some of the problems that the U.S. faces today, and make a case for how new fiscal policy as a part of a larger national strategic narrative might change the fate of the empire of the United States of America.

KEYWORDS: Fiscal Policy, Empire, Collapse, Complexity, Sustainability, National Strategic Plan

MASTER OF BUSINESS ADMINISTRATION

ANALYSIS OF U.S. MILITARY HELICOPTER OPERATIONS IN SUPPORT OF HUMANITARIAN ASSISTANCE AND DISASTER RELIEF

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B.A., Saint Leo University, 2003**

Master of Business Administration—December 2011

Advisor: Susan K. Heath, Graduate School of Business and Public Policy

Second Reader: Brad Naegle, Graduate School of Business and Public Policy

The objective of this project was to compare the relationship between Type Model Series platforms maintenance capability degradation and route selections, using different priorities and timelines. By identifying the top 10 maintenance failures and communicating these needs through the chain of command and supply chain it will minimize the mission capability degradation and maximize our aircraft availability. Establishing delivery routes that will maximize the number of sorties each aircraft can fly will help determine what percentage of overall demand we can meet. As the DOD budget continues to decrease, we need to find a more efficient way to maximize our resources and reduce our costs. The research team analyzed the impact of assigning aircraft by the lowest cost per flight hour in comparison to the other available T/M/S platforms. This analysis also clarifies the cost benefit analysis of the ARG versus CSG battle groups. By using the lessons learned from this project it will help ensure that each Humanitarian Assistance Disaster Relief mission is delivering the right supplies by the right T/M/S platforms for the right price.

KEYWORDS: Helicopter, Effectiveness, Capacity, Disaster Response, Carrier Strike Group, Amphibious Readiness Group, Timeline and Cost Per Hour.

GREEN ACQUISITION GAP ANALYSIS OF THE UNITED STATES AIR FORCE OPERATIONAL CONTRACTING ORGANIZATIONS

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Master of Business Administration—December 2011

Co-Advisor: Max Kidalov, Graduate School of Business and Public Policy

Co-Advisor: Cory Yoder, Graduate School of Business and Public Policy

In this paper we explore the goals and requirements of green procurement in order to understand the degree of success with which the Air Force is incorporating the Department of Defense's Green Procurement Plan (GPP) into its procurement process. This paper provides an outline of the federal policies and guidance to include the most recent Executive Order 13,514 (2009) and the Federal Acquisition Regulations. We examine the Air Force's progress towards a more environmentally friendly state, measured by the metrics set forth in the DoD GPP. We conducted an analysis to determine if the Air Force is implementing environmental considerations to the utmost of its ability. This analysis relied on the use of the Green Acquisition Gap Analysis (GAGA) model, which is a unique framework that we developed that fuses the platform, protocol, and personnel pillars of the Mandatory Pillars for Integrative Success (MPIS) with the Contract Management Process, which dissects the six segments of the contracting process to include procurement planning, solicitation planning, the solicitation, source selection, contract administration, and contract closeout or termination phase. Further, we identify leading Air Force installations by working with the key leadership responsible for implementing environmental goals into the procurement processes in order to document best practices for Air Force-wide dissemination.

KEYWORDS: Affirmative Procurement, CMP, Contract Management Process, Energy, Environment, Environmental, EO 13514, Executive Order 13514, GAGA model, Green Acquisition Gap Analysis model, Green

Procurement, Mandatory Pillars for Integrative Success, MPIS, Operational Contracting, Plan, Procurement, Purchasing, Sustainability, Sustainable

**DEFENSE EXPENDITURES AND THE ECONOMIC-GROWTH NEXUS:
THE CASE OF TURKEY**

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Support Advisor: Max V. Kidalov, Graduate School of Business and Public Policy

This project is intended to reveal the relationship, if any, between the economic performance, namely the Gross Domestic Product (GDP) growth rate, and the defense expenditures of Turkey, and to analyze the tradeoffs between budgetary outlays for welfare spending and defense expenditures. The project also inquires into existing contradictions in previous studies on the defense–growth relationship and analyzes the reasons for those contradictions. Furthermore, an analysis of upward and downward pressures on Turkish defense expenditures is made with the purpose of revealing the noneconomic factors that put pressure on decision makers in their tradeoff decisions within the limited national budget. The findings of this part imply that the results of an econometric analysis of the defense-growth relationship based solely on economic data would be distorted by the effects of these pressures, most of which are very difficult to quantify and incorporate within an econometric model.

There is a rich literature on defense-growth relationship that describes the mechanisms of how defense expenditures can theoretically influence economic growth. To test the relevance of a proposal derived from this body of knowledge, that defense expenditures have a negative effect on economic growth, a simple regression model was developed for explaining the GDP growth rate of Turkey between 1989 and 2009 during which time the defense-burden ratio lagged for one year. The results suggest that there is no significant relationship between the Turkish defense burden and the economic growth. In the tradeoff part of the empirical case study, three models were built to analyze the relationships between health, education, and defense expenditures as well as the relationship between welfare spending (the sum of health and education expenditures) and defense spending for the one-party-government period between 2003 and 2011. The results of this part suggest that there was, in fact, a significant tradeoff state between welfare and defense expenditures in favor of welfare during this period.

KEYWORDS: Defense economics, economic growth, defense burden, military expenditures, defense spending, defense versus welfare tradeoff

**COST-BENEFIT ANALYSIS OF THE MARSOC MARINES
IN THE NAVAL POSTGRADUATE SCHOOL DEPARTMENT OF DEFENSE ANALYSIS**

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Master of Business Administration—December 2011

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Support Advisor: Keenan Yoho, Graduate School of Business and Public Policy

The United States Marine Corps does not have a specific professional military education program for Special Forces. Furthermore, it does not send any of its officers or NCOs to the Naval Postgraduate School to attain a master's degree in Defense Analysis. Studies completed in sister services have shown this program to be invaluable to its future staff officers. This project will conduct a cost-benefit analysis of the United States Marine Corps sending Marine special-forces officers through a dedicated training pipeline, and more specifically the Naval Postgraduate School's defense-analysis programs (irregular warfare, information operations, terrorist

operations and financing). This thesis will aid the Marine Corps in determining the costs and benefits (with dollar amount) of sending its officers through the Naval Postgraduate School's DA Program.

KEYWORDS: Cost Benefit Analysis, MARSOC Marines, Defense Analysis Program, Marine Special Forces, MARSOC, MARSOE, CBA, DA Program, Cost-Benefit, MARSOC ITC, SOF PME, Special Operations Forces Professional Military Education

JOINT-BASE CONTRACTING: A COMPARATIVE ANALYSIS OF JOINT BASE CONTRACTING ACTIVITIES BETWEEN SERVICES

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Master of Business Administration—December 2011

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The Department of Defense (DoD) recently created twelve joint bases by consolidating the support functions of geographically close bases under the lead of a single service. The 2005 Base Closure and Realignment Commission (BRAC) recommended the joint-basing initiative based on the expected savings of \$183.8 million annually. The objectives of the BRAC process were to achieve cost savings, transformation, improvement of capabilities, and enhancement of military value.

Using a case study approach, this research identified the specific factors that contribute to the organizational successes of joint base contracting at Joint-Base San Antonio (JBSA) and Joint-Base Lewis-McChord (JBLM). These factors include processes, governance structures, organizational structures, and communication. This research also identifies barriers to consolidation, as well as comparing and contrasting the way JBSA and JBLM operate. Additionally, this research identifies strengths and weaknesses of the approaches used by the Air Force and the Army. Thus, by documenting specific enablers and barriers, this research should help to guide the planning and implementation of future consolidations throughout DoD and other government organizations.

KEYWORDS: Contracting, Strategic Sourcing, Procurement, Base Realignment and Closure, Consolidation, Change Management, Mergers and Acquisitions, Joint Base, Organizational Design

A BENCHMARK STUDY OF THE AIR FORCE PROGRAM EXECUTIVE OFFICE FOR COMBAT AND MISSION SUPPORT (AFPEO/CM)

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Master of Business Administration—December 2011

Lead Advisor: Rene Rendon, Graduate School of Business and Public Policy

Support Advisor: Bryan Hudgens, Graduate School of Business and Public Policy

The purpose of this research is to provide the Air Force, Army and Navy with a benchmark study of lessons learned from the implementation of the Air Force PEO for Combat and Mission Support office. Under Secretary of Defense for Acquisition, Technology & Logistics Ashton Carter, expressed in his June 2010 memorandum to all military department secretaries' implementation, entitled, *Better Buying Power-Obtaining Greater Efficiency and Productivity in Defense Spending*, a need to improve tradecraft in service acquisition across the DoD. His memorandum directly stated that the Army and Navy should, "following the Air Force's example," create a senior manager for the acquisition of services. This benchmark study seeks to use the GAO Framework for Assessing the Acquisition Function at Federal Agencies to provide a list of best practices to all DoD services.

KEYWORDS: Air Force Program Executive Office for Combat and Mission Support, Better Buying Practices

**PROCUREMENT INTEGRITY IN CONTINGENCY OPERATIONS: A CASE STUDY
OF ARMY CONTRACTING OFFICER CORRUPTION IN OPERATIONS IRAQI
AND ENDURING FREEDOM UTILIZING OCCUPATIONAL FRAUD THEORY**

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Master of Business Administration—December 2011

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Support Advisor: Cory Yoder, Graduate School of Business and Public Policy

This project analyzes the conditions that enabled corruption of Army Contingency Contracting Officers (CCOs) during Operations Iraqi Freedom and Enduring Freedom (OIF/OEF) by applying occupational fraud theory, specifically the classic sociological/criminological Fraud Triangle model (Cressey, 1953), to determine its validity in a contingency operation. By examining the contracting environment in OIF and OEF and utilizing the conceptual framework of occupational fraud theory, I identify the distinctive situational elements of a contingency operation that influence an individual's decision to commit fraud and thus affect the probability of fraud occurring in contingency operations. By analyzing the procurement fraud environment in OIF and OEF using an occupational fraud model, I provide the foundation for understanding why fraud occurs in the context of contingency operations with the intent of preventing future procurement integrity violations. Reducing instances of fraud directly impacts the appropriate utilization of taxpayer funding and the operational readiness of the warfighter, as well as enhances the reputation and standing of the Army CCO Corps.

KEYWORDS: Contingency Contracting, Fraud, Corruption, Occupational Fraud Theory, Fraud Triangle, Operation Iraqi Freedom, Operation Enduring Freedom

**ASSESSING THE STATE OF PROCUREMENT KNOWLEDGE PRODUCTION:
IMPLICATIONS FOR THE FEDERAL GOVERNMENT**

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Master of Business Administration—December 2011

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and Public Policy**

Support Advisor: Timothy S. Reed, Graduate School of Business and Public Policy

This study seeks to understand the realm of purchasing knowledge in order to glean theoretical and practical insights that are useful to academicians and practitioners. The primary goals are to evaluate the extent to which purchasing research relies on theory and to identify and summarize the central theories germane to the purchasing discipline. Additionally, using social network analysis, this study explores patterns and insights from knowledge producers (i.e., individuals and institutions) and knowledge repositories (i.e., academic journals). Finally, this research combines the theoretical analysis and the social network analysis to identify the best practices that can be used in federal procurement.

KEYWORDS: Theory Development, Procurement Research, Social Network Analysis, Best Practices, Federal Procurement, Acquisition, Purchasing, Academic Journals, Gap-Analysis, Organizational Structure

MASTER OF BUSINESS ADMINISTRATION

ANALYSIS OF NAVY JOINT CONTINGENCY CONTRACTING

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Master of Business Administration—December 2011

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Support Advisor: LCDR Bryan Lundgren, USN, Graduate School of Business and Public Policy

At the turn of the century and with the end of the cold war traditional twentieth century combat methods underwent a radical change. Armies no longer faced off over strategic pieces of land, but fought asymmetrical battles involving small scale raids against one another in urban environments. This change required a smaller more agile force that could respond to small scale insurgent attacks. In order to achieve this smaller force the services started to contract out auxiliary services freeing up soldiers for combat.

With the rise of contracted auxiliary support came the need for experienced and qualified contracting personnel who could deploy with combat troops around the world to quickly provide the needed auxiliary support. In response to this need Congress mandated the implementation of joint contingency contracting policies for combat operations in January 2008 (10 USC 2333).

With the new role of Navy personnel as individual augmentees (IA) supporting combat ground forces for Operation Enduring Freedom (OEF) in Afghanistan and Operation Iraqi Freedom (OIF) in Iraq, the need for experienced and qualified Navy Contracting Officers has increased. This report examines to what extent the Navy has implemented 10 USC 2333 and the impact it is having on Navy contracting officers.

KEYWORDS: Navy Contingency Contracting, JCASO, 10 USC 2333, Gansler Commission Report, Yoder Three-Tier Model

ANALYZING COST, SCHEDULE, AND ENGINEERING

VARIANCES ON ACQUISITION PROGRAMS

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Michael R. Schilling—Lieutenant Commander, United States Navy

Master of Business Administration—December 2011

Lead Advisor: Lt Col Timothy G. Hawkins, USAF, Graduate School of Business and Public Policy

Support Advisor: Gregory Hildebrandt, Graduate School of Business and Public Policy

This study of cost, schedule, and engineering variance (CV, SV, and EV) data identified in the Selected Acquisition Reports (SARs) of acquisition programs indicates that early program variances are significantly associated with future program variances. An enhanced understanding of CV, SV, and EV interrelationships and the connection between these program variances and the cost and schedule Earned Value contract variances will allow program managers to better understand the full programmatic impact of a variance problem. This understanding could also aid future researchers in identifying best practices in recovering from the identification of such a problem. In addition, the identification of CV, SV, and EV differences across Major Defense Acquisition Program (MDAP) types highlights the connection between segments of the defense industry and the development of best program management practices.

This research first examines data using traditional descriptive statistics in order to determine whether identifiable patterns exist among MDAPs and their associated contracts.

A primary objective of the analysis is to develop empirical models that employ cross-sectional, time-series data contained in the SARs. These models help explain the full effect of fixed-price incentive R&D contracts within MDAPs on cost and schedule variance during both engineering and manufacturing development (EMD) and production and deployment.

It is anticipated that this analysis will also help close any existing gaps in the understanding of program versus contract management data.

KEYWORDS: Defense Acquisition, Oversight, Contract Type, Earned Value Management, Regression

**AN ANALYTICAL HISTORY OF PROVIDER ORGANIZATION SUPPORT
WITHIN NAVY ENTERPRISE: NAVAL SUPPLY SYSTEMS COMMAND**

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Master of Business Administration—December 2011

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In an increasingly constrained resource environment, the enterprise approach was introduced in the U.S. Navy to empower stakeholders across multiple commands to take a holistic view of objectives and processes and become unified to achieve required output with greater efficiency. As a member of the Navy Provider Enterprise (NPE), Naval Supply Systems Command (NAVSUP) is responsible for providing services, equipment and other resources to the Warfare Enterprises with focus of future readiness at minimal cost.

This project focuses on enterprise practices within NAVSUP. It analyzes how NAVSUP Enterprise was implemented and designed to function within the NPE construct. This project also describes NAVSUP's execution of the organizational change process and analyzes to what extent change is occurring.

The results of this thesis reveal that the NAVSUP Provider Enterprise is achieving positive organizational change through the implementation of collaborative enterprise management practices. The thesis reveals some identifiable organizational challenges and change issues that inhibit the achievement of NAVSUP Provider Enterprise goals. These findings are used to develop and present a series of recommendations to assist the leadership to further align NAVSUP provider enterprise actions with the change objectives.

ENHANCING THE ENHANCED, SCENARIO-BASED METHOD OF COST-RISK ANALYSIS

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Master of Business Administration—December 2011

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The current S-curve method of cost-risk analysis for major DON acquisitions projects does not accurately estimate actual cost when the program reaches full rate production. Another, sometimes more effective method of measuring cost risk, is by using the enhanced scenario-based method (eSBM) of risk analysis. The reason that cost estimations from the milestone B costs are inaccurate is that very little, if any, real information about the project is known. eSBM allows managers a less statistically tasking method of determining cost risk for a project while still maintaining the requirements of the Weapons System Acquisitions Reform Act. The key factors in measuring the usefulness of eSBM should be focused on the acquisition strategy being used for the project and the time frame from milestone b to later milestones. I presume that different acquisition strategies will yield different levels of success in estimating cost risk for eSBM.

KEYWORDS: Scenario Based Method, SBM, Enhanced Scenario Based Method, eSBM, Cost Growth Factor, CGF, Coefficient of Variation, CV, Cost Risk Analysis, Risk Adjusted Cost Estimate

**IMPROVING THE TRANSPARENCY/ANTI-CORRUPTION EFFORTS IN DEFENSE
PROCUREMENT: RECOMMENDATIONS FROM GLOBAL PRACTICES**

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MASTER OF BUSINESS ADMINISTRATION

The purpose of this MBA Project is to explore the risks of corruption throughout the defense procurement cycle, and provide an overview of existing anti-corruption conventions and tools. This report includes background information and corruption focused analysis about defense offset agreements and single-source selection methods. The findings related to these corruption risks are supported with the analysis of three informative defense procurement cases. Additionally, the effectiveness of anti-corruption conventions is evaluated through ten countries' score changes in major corruption indices. Finally, several recommendations are offered to improve the integrity, transparency, and accountability of defense purchases.

KEYWORDS: Transparency, Corruption, Defense Procurement, Single-Source Contracts, Offset Agreements, Anti-Corruption Conventions.

AN ANALYSIS OF THE BEST-AVAILABLE, UNMANNED GROUND VEHICLE IN THE CURRENT MARKET, WITH RESPECT TO THE REQUIREMENTS OF THE TURKISH MINISTRY OF NATIONAL DEFENSE

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Today, unmanned ground vehicles (UGVs) provide significant supporting capabilities in military operations worldwide. When UGVs are used to their full potential, the number of casualties is decreased and the combat effectiveness of warfighters is increased. UGVs are being developed in different sizes to meet different mission capability requirements. The employment of available UGVs and the development of new UGV capabilities have been rising steadily.

Countries have started giving more importance to UGVs, and they are now being employed all over the world. The Turkish ministry of national defense (MND) can use the advantages of UGVs in a number of ways to assist in its efforts against terrorist activities.

The purpose of this MBA project is to conduct an analysis of the best available UGV in the current market with respect to the requirements of the Turkish MND. After providing some background and market research on UGVs, we will explore their capabilities and their capability gaps in regard to the requirements of the Turkish MND. In the end, this project will determine the best available near-term UGV for the Turkish MND by employing the analysis of alternatives (AoA) method of the U.S. defense-acquisition system.

KEYWORDS: Unmanned Ground Vehicles, UGVs

DEVELOPMENT OF A RAPIDLY DEPLOYABLE, SPECIAL OPERATIONS COMPONENT COMMAND (SOCC) CORE CONCEPT FOR THE NORTH ATLANTIC TREATY ORGANIZATION (NATO) SPECIAL OPERATIONS HEADQUARTERS (NSHQ)

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The North Atlantic Treaty Organization (NATO) Special Operations Headquarters (NSHQ) is the primary point of development, direction, and coordination for all NATO Special Operations—related activities. NSHQ could enhance the effectiveness of NATO Special Operations Forces (SOF) and increase the probability of

mission accomplishment when NATO SOF assets are collectively employed in a combined manner by adding an operational command and control capability. This would be in the form of a Special Operations Component Command (SOCC) “core.” The SOCC core is an advanced party of 70–150 personnel who provide an organic, rapidly deployable headquarters (HQ) capability for NSHQ. NSHQ does not currently have the ability to provide NATO with a rapidly deployable asset package, which would include a full suite of operational command, control, communication, computers, and intelligence (C4I) capabilities equipped with organic SOF and their enablers.

The purpose of this thesis is to examine equipment and deployment configurations that will fulfill the mission requirements of the SOCC Core. An analysis of alternatives is conducted to determine which equipment types and configurations achieved the desired robust mission capability at the lowest possible cost. The focus is on the make-up of the four subcomponents of the SOCC core. These subcomponents are the Operations Center (OPCEN), All-Source Center (ASC), Support Center (SUPCEN), and the Signals Center (SIGCEN). Possessing a rapidly deployable SOCC Core would be a sound step toward establishing and ensuring interoperability among allied SOF units and commands and would enhance the employment of NATO SOFs.

KEYWORDS: Development of a Rapidly Deployable Special Operations Component Command (SOCC) Core Concept for the North Atlantic Treaty Organization (NATO) Special Operations Headquarters (NSHQ)

ANALYSIS OF THE UNITED STATES MARINE CORPS’ UTILIZATION OF DEFENSE LOGISTICS AGENCY DISPOSITION SERVICES AS A SOURCE OF SUPPLY

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Master of Business Administration—December 2011

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The mission of Defense Logistics Agency (DLA) Disposition Services (DDS) is to provide centralized Department of Defense (DoD) disposal management of excess and surplus military property supporting U.S. military forces worldwide, federal agencies, state agencies, and foreign military sales. An important component of this mission is the reutilization of excess military equipment within the military services in order to prevent wasteful DoD purchases. DoD reutilization—the use of excess or surplus property to meet known or anticipated requirements—has been a prominent topic within the U.S. Congress since a Government Accountability Office (GAO) report in 2005 uncovered billions of dollars in wasteful DoD purchases. Since that report, the DLA has launched several initiatives to improve Service reutilization of military equipment. Projected near-term DoD budget cuts will serve to further highlight the topic.

The purpose of this research is to analyze the extent to which the United States Marine Corps (USMC) is implementing reutilization through its use of DDS as a source of supply. The results and recommendations of this study will enable decision makers within the USMC and DLA to address institutional and systemic obstacles to maximum DDS reutilization within the USMC, thereby improving overall DoD economy.

KEYWORDS: Excess Equipment, Supply Condition Code, Disposal, Reutilization

A PROFICIENCY-BASED COST ESTIMATE OF SURFACE-WARFARE OFFICER ON-THE-JOB TRAINING

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MASTER OF BUSINESS ADMINISTRATION

Since 2003, the surface warfare officer (SWO) community has changed initial training on two occasions. In 2003, they replaced schoolhouse training (SWOS) with an OJT intensive shipboard computer-based-training in response to criticism that SWOS was a wasteful use of six months. Yet, SWOs considered “SWOS-at-sea” inadequate fleet preparation, prompting the reestablishment of one month of “SWO intro.” A 2010 Government Accountability Office report concluded the Navy must evaluate how changes to training impact job performance, not just budgetary costs. Analysis of SWO training costs should consider how training changes impact officer proficiencies and qualification time.

This thesis calculates the SWO OJT investment assuming the Navy subsidizes officer development until officers achieve SWO qualification. The research proposes first-tour officer proficiency is a function of commissioning source and initial training professional development. After arrival at the ship, proficiency is measured by SWO personnel qualification standards (PQS) progress and, ultimately, SWO qualification. The analysis finds that decreases to initial training increase shipboard training costs, and that changes to initial training have not been accommodated by appropriate shifts in qualification time requirements. Recommendations include adopting SWOS’s proposal for two months of initial training in San Diego and Norfolk, ensuring SWOS learning outcomes are based on SWO PQS, and adjusting SWO qualification time requirements to reflect level of initial training.

KEYWORDS: Surface Warfare Officer, SWO, Cost Estimate, Qualification, Standards, Investment

A BASELINE ANALYSIS OF IN-TRANSIT SHIPPING TIME INTO AND THROUGH THE FIFTH FLEET AREA OF OPERATION WITH RESPECT TO THE SUPPLY CHAIN LAST NAUTICAL MILE

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In FY 2010, the Department of Defense (DoD) spent more than \$210 billion on supply-chain management. However, the Government Accountability Office has identified DoD supply chain management as a high-risk area, specifically forecasting, asset visibility, and materiel distribution. Additionally, the DoD has not developed the means to measure the effectiveness of implemented actions or defined root causes as they pertain to the warfighter. The purpose of this study is to examine current supply chain practices and procedures within the Department of the Navy (DoN). The goal is to provide a baseline for comparing the in-transit shipping times of three shipping priority categories to identify potential problem areas within the DoN logistics network, specifically within the Fifth Fleet area of operation (AOR). Identifying potential weaknesses within the supply chain provides suggestions for further study to best identify cost effective ways to improve material movement, processes, and to increase the readiness of the warfighter.

KEYWORDS: Supply Chain Visibility; Last-Mile Logistics; United States Fifth Fleet

COST-COMPARATIVE ANALYSIS OF BLAST-MITIGATION TECHNOLOGIES WITH REGARD TO EXPLOSIVE REMNANTS OF WAR (ERW)

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Master of Business Administration—December 2011

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The purpose of this MBA project is to investigate and analyze different forms of blast-mitigation technologies that provide safe temporary storage, and in the event of a detonation, provide protection measures for person-

nel and property. A comprehensive cost comparison of an explosive-storage magazine (ESM) and two alternatives: the Explosive Remnants of War Collection Point (ERW-CP) and Blastwrap are analyzed to determine future options. The goal of this project is to identify and document both cost comparisons, as well as requirement satisfaction for the safe and cost-effective temporary storage in troubled regions around the globe.

KEYWORDS: cost comparative analysis, explosive remnants of war, blast mitigation, explosives, demining, unexploded ordnance

CONQUERING THE IRON MOUNTAIN: REDUCING THE MARINE EXPEDITIONARY UNIT'S LOGISTICS FOOTPRINT WITHIN THE AMPHIBIOUS READINESS GROUP

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The Marine Corps-Navy team employs a concept of forward power projection under the Marine expeditionary unit (MEU). The MEU is built around a reinforced infantry battalion and an attached aviation element. The logistical unit of the MEU is the combat logistic battalion (CLB). The CLB is tasked with embarking with fifteen days of supply (DOS) to support the entire MEU should it be tasked into an austere environment for actions across a range of military operations (ROMO). Over the course of this sustainment concept, the Marine Corps has developed logistics habits, often dubbed the “iron mountain,” that have led to each CLB on each MEU embarking with as much materiel as possible in order to meet the deployed maintenance needs. This process has led to great waste and an unnecessarily large materiel footprint, both aboard U.S. Navy ships and on the ground. This project sought to create a method that can be used to create the sustainment block more efficiently and in far less time using historical usage data and better information about resupply lead times, criticality, and demand. This data was analyzed using a multi-attribute, decision-making tool to weigh all factors and found that it is possible to craft a better source of sustainment.

KEYWORDS: Expeditionary Logistics, Support, Class IX, Sustainment Block, Marine Expeditionary Unit, Sustainment Block

ANALYZING COMMODITY COUNCIL DEVELOPMENT AND IMPLEMENTATION: THE AIR FORCE FURNISHINGS COMMODITY COUNCIL

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Master of Business Administration—December 2011

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Support Advisor: Rene Rendon, Graduate School of Business and Public Policy

This study seeks to understand the factors that contributed to the successful development and implementation of the Air Force Furnishings Commodity Council (AFFCC). Specifically, we explore the challenges associated with supporting small business goals without sacrificing strategic outcomes, the difficulties of standing up a commodity council whose spend has no functional ownership or centralized funding, and the complexities of establishing accurate cost savings performance and validation metrics. We also explore the concept of maximizing the utilization of the AFFCC by Air Force organizations.

KEYWORDS: Air Force, Bundling, Commodity Council, Consolidation, Furnishings, Market Research, Small Business, Spend Analysis, Standardization, Strategic Sourcing

MASTER OF BUSINESS ADMINISTRATION

ANALYZING BENEFITS OF EXTENDING THE PERMANENT CHANGE OF STATION (PCS) TEMPO IN THE MARINE CORPS

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Master of Business Administration—December 2011

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This MBA professional report examines the impact of extending the PCS tempo for enlisted Marines and Marine Corps officers. The primary objective is to analyze how relaxing the permanent change of station (PCS) cycle from 36 months to 48 months influences costs, unit efficiency, individual promotion, and family stress. By lowering personnel fluctuation in any given Marine Corps organization, the unit may acquire and retain personnel experience that makes it more productive. Finally, this study examines how PCS moves affect Marine dependents. Increasing in the number of household moves through the PCS process possibly causes high levels of stress on the Marine and his or her family, causes changes in children's educational experience, and affects spouse's income, career choice and higher learning. Observations derived from data gathered demonstrate the Marine Corps can possibly save an estimated \$14.6 million annually by keeping Marines on station 36 months or longer, and that an increase in PCS frequency increases a Marine's likelihood of being promoted. However, extended TOS by itself does not necessarily equate to units that are more effective. Lastly, an anonymous survey administered to various Marine units suggests that PCS relocations cause stress at home and affect spouse income and higher education.

KEYWORDS: Permanent Change of Station (PCS), Military Promotions, PCS Related Stress, Family Stress, PCS and Unit Efficiency

ANALYSIS OF ARMY CONTRACTING OFFICER REPRESENTATIVE ROLE IN CONTINGENCY OPERATIONS

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Master of Business Administration—December 2011

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Support Advisor: LTC Scott Nestler, USA, Department of Operations Research

This project provides a review and analysis of procurement fraud committed by the Army Contracting Officer Representative (COR) during Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF), assesses the subsequent Army response, examines the behavioral model behind the Gansler Commission on fraud, and identifies the elements of a contingency environment that are conducive to fraud. Case analysis of procurement fraud is presented to illustrate the types of fraud that are committed and provide the basis of procurement fraud. Based on the research findings, the author highlights the ineffectiveness and shortcomings of the current COR training program for the purpose of providing education and training recommendations to the Army acquisition workforce.

KEYWORDS: Contracting officer, wartime contracting, Gansler Commission, Army Expeditionary

BUSINESS-CASE ANALYSIS OF CARGO, UNMANNED-AIRCRAFT SYSTEM (UAS) CAPABILITY IN SUPPORT OF FORWARD DEPLOYED LOGISTICS IN OPERATION ENDURING FREEDOM (OEF)

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Co-Advisor: Daniel A. Nussbaum, Department of Operations Research

Based on our analysis K-MAX is an attractive alternative to current methods of resupply. These findings led to our conclusion that the K-MAX is a program worthy of DoD investment and becoming a program of record.

The concept for the utilization of unmanned aircraft system (UAS) capability in support of logistics in operation enduring freedom (OEF) is in response to a United States Marine Corps urgent needs requirement. This capability significantly decreases the ground convoy requirement. In addition, the introduction of UAS would reduce American forces' exposure to exterior enemy threats while conducting resupply missions.

The cargo UAS (CUAS) program is a Naval Air Systems Command (NAVAIRSYSCOM) initiative. The Marines' main interest in the program is the ability to have a system that can operate autonomously beyond line of sight with GPS en route waypoint navigation and be controlled remotely at designated cargo delivery locations. The purpose of this study is to estimate potential cost savings in the form of resource human life valuations. This study conducts a business case analysis (BCA) comparing the estimated costs of the UAS program to the current methods for providing logistical support through traditional ground convoys, fixed and rotary wing assets.

KEYWORDS: Business Case Analysis (BCA), Cargo Unmanned Aircraft Systems (CUAS), Operation Enduring Freedom (OEF)

CORPORATE SOCIAL RESPONSIBILITY: A COMPARISON BETWEEN GOVERNMENT CONTRACTORS AND COMPANIES THAT RECEIVE REVENUES FROM COMMERCIAL SOURCES

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Master of Business Administration—December 2011

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The purpose of this research is to analyze the level of emphasis placed on the corporate social responsibility (CSR) categories (health and safety, environment, diversity, human rights, discretionary, and corporate) between defense contractors and companies that receive the majority of their revenues from commercial sources. Five companies were selected from each of the following three groups: defense contractors, top CSR companies, and largest companies from a diverse industry base. The results indicate that defense contractors place less emphasis on the CSR categories than those companies that receive their revenues from commercial sources. Specifically, defense contractors were rated lower in the human rights and corporate categories. This exploratory study establishes a foundation for future research in the relationship between CSR principles and defense contractors.

KEYWORDS: Defense Contractors, Corporate Social Responsibility, Health, Safety, Environment, Human Rights, Diversity, Corporate

OPTIMIZING THE GROUND-MOBILE-RADIO BASIS OF ISSUE PLAN FOR THE U.S. ARMY HEAVY-BRIGADE-COMBAT TEAM

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Master of Business Administration—December 2011

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The ground-mobile radio (GMR) is a communications system designed to enhance data throughput and communications within the U.S. Armed Forces. The GMR utilizes the wideband networking waveform (WNW)

and the soldier radio waveform (SRW) to increase throughput while simultaneously emulating up to four current force radios. This study investigates the appropriate basis of issue plan (BOIP) for fielding the GMR to a heavy brigade combat team (HBCT). Optimization modeling is used to generate the appropriate BOIP based on an objective function to minimize radio costs, decision variables to assign radio types and quantities to each platform, and constraints in platform requirement and radio capabilities. We create multiple variations of the optimization model to determine the optimal BOIP for different levels of requirements and then make recommendations regarding the best radio mix for an HBCT under each set of requirements. We find that the majority of the four channel simultaneity requirements for the GMR are not required in an HBCT and that only three out of 14 were used in the optimal solutions. Our analysis also indicates that adding a new simultaneity that had not previously been considered offers a potential cost savings for each HBCT.

KEYWORDS: Ground Mobile Radio (GMR), Wideband Networking Waveform (WNW), Soldier Radio Waveform (SRW), Basis of Issue Plan (BOIP), Heavy Brigade Combat Team (HBCT), Optimization Modeling

A BUSINESS-CASE ANALYSIS FOR UPGRADING THE CURRENT AERIAL RECONNAISSANCE LOW FLEET TO THE Q400 AIRCRAFT

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Master of Business Administration—December 2011

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**Support Advisor: COL Keith Hirschman, USA, Program Executive Office,
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This report identifies the potential benefits and costs of upgrading the current fleet of DHC-7 aircraft to the Q400. We accomplish this through conducting an analysis of the Army's current operational mission sets, the projected life cycle costs of each aircraft, and the alternative courses of action. In addition, we utilize value engineering and feedback analysis tools to support the recommendations and findings. Once complete, the final product from this research could become part of a future aerial requirements packet for the Aerial Common Sensors (ACS) program. The aerial reconnaissance and exploitation sensors (ARES) program office, located at the Aberdeen Proving Grounds, MD will receive the results of the research identifying the financial and performance benefits of purchasing the Q400.

KEYWORDS: Aircraft, Business Case Analysis, Aerial Reconnaissance Low, Q400, DCH-7

MISSION AND INSTALLATION CONTRACTING COMMAND SERVICES ACQUISITION: EMPIRICAL ANALYSIS OF ARMY SERVICE-CONTRACT MANAGEMENT PRACTICES

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The overall purpose of this research is to develop a comprehensive understanding of how the Army Mission and Installation Contracting Command (MICC) manages the acquisition of services. The specific objective of the proposed research project is to build on the understanding developed in prior research projects and to identify the factors that promote or obstruct the use of best practices in acquisition management and influence the efficiency and effectiveness of service contracts performance. In this study, data is collected from eight Army installation contracting offices, and is meant to serve as a follow-on project for research conducted at additional mission and installation contracting command offices. In prior research projects, researchers showed a relationship between service type and contract characteristics and management practices, as well as a

relationship between capacity and management practices. The current study confirms the findings of previous researchers and provides recommendations for improving performance of service contracts through enhanced capabilities and acquisition processes.

KEYWORDS: Services Acquisition, Mission Installation Contracting Command, Capacity Management, Contract Characteristics, Contract Management Practices, Service Type

THE NETT WARRIOR SYSTEM: A CASE STUDY FOR THE ACQUISITION OF SOLDIER SYSTEMS

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Master of Business Administration—December 2011

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Support Advisor: Keith L. Snider, Graduate School of Business and Public Policy

This project provides an analysis of the Army's acquisition of the Nett Warrior (NW) soldier system. Its objectives are to document the legacy of the system and provide an overview of how acquisition strategy has adapted with respect to key acquisition elements since its inception on September 8, 1993. The product is a document that provides an analysis of the actions taken and the obstacles encountered and how the warfighters, user representatives, materiel developers, and lawmakers dealt with them. The NW need was approved in February 2009. The requirement was to provide improvements for dismounted soldiers in the five specific capability categories of lethality, command and control, mobility, survivability, and sustainment. For a period lasting approximately 20 years, the NW has evolved. Despite the Army's decision to terminate the Land Warrior, the predecessor system to the Nett Warrior, in FY 2007, the NW's foundation for follow-on soldier system initiatives had been established. The success of NW will be dependent upon the program's ability to incorporate soldier-driven design requirements, integration of commercial technology, and thorough system testing.

KEYWORDS: Nett Warrior, Nett Warrior Increment I, Land Warrior, Land Warrior Soldier System, Soldier as a System, Ground Soldier System, 4-9 Infantry Battalion, Unit System Integrators, TCM Soldier, PEO Solider, Program Manager Soldier Warrior, Product Manager Land Warrior, General Dynamics C4 Systems, Net-Centric Warfare, End User Device (EUD), LW-Manchu, LW-Strike

MANAGING RESOURCE TEAMS IN THE HELLENIC NAVY

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Master of Business Administration—December 2011

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Co- Advisor: Edward H. Powley, Graduate School of Business and Public Policy

In an environment of limited budgets, Greek resource teams serve as a critical tool in maximizing return on investment (ROI). Finding ways to lower costs while maintaining efficiency is one of the key issues for the Hellenic Navy Logistics Command. The purpose of this report is to examine how these teams can increase their efficiency and effectiveness and ultimately achieve better financial results.

The focus of this study is to define a model of team effectiveness, analyze the determinants of high performance teams, describe their appropriate design and processes in order to be successful as well as to develop a diagnostic mechanism for assessing team effectiveness.

The project presents the resource teams in the Hellenic Navy and two team-oriented, management approaches implemented by the U.S. Navy. The reasons that a team is the ideal organizational unit are analyzed, a review of team effectiveness models is conducted and representative models are provided. Finally, the findings from the literature review are integrated into a systems model and a survey to assess team effectiveness;

organized in three perspectives (inputs–process–outputs). These instruments analyze the key characteristics of high performance teams.

KEYWORDS: Resource Management, Team Effectiveness, High Performance Teams, Performance Measurement, Input-Process-Output Models

COMPARISON OF THREE SUPPLY-DISTRIBUTION SYSTEMS FOR MEDICAL AND SURGICAL SUPPLIES IN THE VETERANS ADMINISTRATION, SIERRA PACIFIC NETWORK

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Michael Owen, Lieutenant, United States Navy

Master of Business Administration–December 2011

Lead Advisor: Kenneth Doerr, Graduate School of Business and Public Policy

Support Advisor: Keebom Kang, Graduate School of Business and Public Policy

This project provides a case study for professors to use in the classroom environment to teach supply chain design, and supply chain inventory policies. It explores the supply chain distribution models being implemented at three Veteran Affairs health care systems within the Sierra Pacific Network. Each system will include the main hospital and all of its off-site clinics. These three systems have different distribution models. In comparing and contrasting the distribution models, the goal is to find potential ways to improve efficiency, productivity, and reduce costs. While making specific recommendations (as to e.g., changes in stocking levels, or vendor agreements) for performance improvement is outside the scope of this project, the analysis based on sample data does suggest areas for further examination. However, with the difference in facility sizes, patient base, and complexity of services provided, one fit for all three facilities may not exist.

KEYWORDS: Distribution Systems, Cost Comparisons, Inventory Analysis, Inventory Management, Just in Time, Hub and Spoke, Low Unit of Measure

BUSINESS-CASE ANALYSIS: INCREASING AIR FORCE DINING-HALL USE AS AN ALTERNATIVE TO CLOSURE

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Master of Business Administration–December 2011

Lead Advisor: Raymond Franck, Graduate School of Business and Public Policy

Support Advisor: Bryan Hudgens, Graduate School of Business and Public Policy

The current Department of Defense fiscal environment demands careful analysis of every dollar spent, and elimination of wasteful and inefficient practices. Over the last decade, the Air Force has closed 49 dining facilities, in many cases due to underuse. Recent graduate research has shown the potential for millions of dollars in savings as a result of closure and the resultant payment of Basic Allowance for Subsistence (BAS) to all airmen in its place. However, no analysis has been performed on the potential impact of increasing dining hall patronage by allowing all base personnel (adding officers, civilians, and retirees) to make use of them when and where feasible. This project will examine this alternative course of action and quantify the savings associated with this possibility by considering additional food expenses and reasonable expectations for increased patronage by performing a business case analysis on the recent pilot program at the Sierra Inn at Travis AFB, CA. This business case analysis template allows for an objective assessment of that decision based on its net present value, and should be of value elsewhere in the Air Force in both the decision to implement the Food Transformation, and as a metric of effectiveness after implementation.

KEYWORDS: Dining facility, food services, facility closure, Basic Allowance for Subsistence

BENEFITS OF AN AIR FORCE CONTRACTING WARRANT-OFFICER PROGRAM

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Master of Business Administration—December 2011

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The purpose of this research is to develop baseline research that can be expounded by future researchers to solidify the warrant officer track as a solution to creating a better contracting workforce through increased experience and more confidence within the contracting career field. This research investigates the perceived benefits and contrasting effects of adding the warrant officer track into the contracting career field. The assessment uses personal interviews and surveys covering job satisfaction model and expectancy theory. In addition, pay charts and scales are used to assess cost. Currently the Air Force (AF) is experiencing challenges in the contracting and acquisitions career field.

KEYWORDS: Adding Warrant Officers, Embeddedness, Human Capital, Organizational Behavioral Assessment, Implementation Plan, Air Force

MASTER OF SCIENCE

Applied Mathematics
Applied Physics
Astronautical Engineering
Combat Systems Technology
Computer Science
Contract Management
Defense Analysis
Electrical Engineering
Engineering Science
Information Operations
Information Technology Management
Management
Mechanical Engineering
Operations Research
Physics
Program Management
Space Systems Operations

MASTER OF SCIENCE IN APPLIED MATHEMATICS

GAME THEORY, PROBABILISTIC RISK, AND RANDOMIZED STRATEGY: THE RULEBOOK REVISITED, WITH EMPHASIS ON COAST GUARD MISSION SPACE

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B.S., U.S. Coast Guard Academy, May 1999**

Master of Science in Applied Mathematics—December 2011

Advisor: David L. Alderson, Department of Operations Research

Advisor: Bard K. Mansager, Department of Applied Mathematics

Second Reader: Joseph DiRenzo, United States Coast Guard

The welfare of the United States is highly dependent upon its critical infrastructures and key resources. The Marine Transportation System is critical to the flow of commerce. The United States Coast Guard is charged with facilitating the protection of the Marine Transportation System from acts of terrorism under the Port, Waterways, and Coastal Security Mission. The Coast Guard faces the challenge of providing essential protection strategies with limited resources.

Optimizing limited resources to provide maximum protection from deliberate attacks is a complex problem. In this thesis we explore various analytic techniques that can be used to provide guidance in resource allocation for defense against terrorism. We focus on two techniques, risk-based analysis and game theoretic analysis. We review the fundamental mathematical concepts and philosophical assumptions necessary for these techniques to be applicable.

We review the Coast Guard's role in the protection against potential terrorist attacks. Using a game theory approach, we build a model and present a preliminary analysis on the transportation of commerce along the Pittsburgh Three Rivers area.

KEYWORDS: Game theory, probabilistic risk analysis, randomized strategy, Coast Guard, PWCS

MASTER OF SCIENCE IN APPLIED PHYSICS

FEL MIRROR RESPONSE TO SHIPBOARD VIBRATIONS

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The Optical cavity of a free-electron laser (FEL) is composed of components that must be maintained to very tight tolerances. The shipboard environment is one that will preclude a direct coupling of FEL components to the ship. This thesis will explore the basis for these tight tolerances, and how to isolate them from the FEL.

A solid model of a potential FEL system will be developed using SolidWorks. This model will then be converted to a finite element model in ANSYS. The finite element model will be used to calculate the system's eigenvectors. These eigenvectors will be used to develop a state space model in MATLAB. Driving functions simulating sea state 6 and under water explosion will then be applied to the state space model and the motion of various components will be tracked. This simulated motion will be used to develop and test a passive control system to damp out the vibrational input to the FEL.

It is not possible for a passive system to totally isolate the FEL from excitation by the ship environment. A passive system that minimizes the inputs to an active control system will be developed. An active system that will handle the final mirror stabilization for a FEL optical cavity will be left for further research.

KEYWORDS: Free Electron Laser, FEL, Vibration, Finite Element, Shipboard Vibration, Passive Control, Oscillator, Mirror Alignment, Resonator Alignment

CHARACTERIZATION OF THE MEMS DIRECTIONAL SOUND SENSOR IN THE HIGH-FREQUENCY (15–20 KHZ) RANGE

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Master of Science in Applied Physics—December 2011

Co-Advisor: Gamani Karunasiri, Department of Physics

Co-Advisor: Bruce Denardo, Department of Physics

The Sensor Research Laboratory (SRL) at the Naval Postgraduate School (NPS) has developed a micro-electromechanical-system (MEMS)-based directional sound sensor that mimics the aural system of the *Ormia ochracea* fly. The goal of this research is to characterize a set of directional sound sensors with varying configurations that operate in the high-frequency range (15–20 kHz). The sensor consists of two identical wings coupled in the middle and the entire structure is connected to a substrate using two legs in the middle. In response to sound, the coupled wings oscillate with rocking and bending like motions at frequencies that depend on the mechanical characteristics of the structure. A simulation of sensor characteristics using COMSOL finite element software showed a resonant frequency of about 20 kHz for each device. The devices were fabricated by the MEMSCAP foundry service using silicon-on-insulator (SOI) substrate with a 25 μm device layer. Using a laser vibrometer, response to incident sound pressure was measured at different frequencies and angles. All the devices showed that measured and simulated frequencies were in reasonably close agreement. The measurements showed good sensitivity to the direction of sound as predicted.

KEYWORDS: MEMS, Ormia, Ormia Ochracea, Directional Microphone, Sensor, Fly Hearing, High Frequency

A FRAMEWORK FOR COLLABORATIVE QUADROTOR-GROUND-ROBOT MISSIONS

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Master of Science in Applied Physics–December 2011

Master of Science in Mechanical Engineering–December 2011

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Co-Advisor: Richard Harkins, Department of Physics

The thesis proposes a real-time control algorithm for the cooperation of a joint team consisting of a quadrotor and a ground robot for coordinated ISR missions. The intended application focuses on indoor environments, where global-positioning system signals are unreliable or simply unavailable so that the control algorithms must rely on local sensor information. The thesis describes the appropriate set up of the lab and includes simulations using a full dynamic model of the quadrotor and robot, demonstrating the suitability of the implemented and the proposed control scheme into a waypoint navigation scenario.

The implemented controller uses the linear quadratic regulator method imposed into five different channels; pitch, roll, yaw, x-y position and height, configured to the appropriate gains for smoother following of the trajectory. The proposed control scheme incorporates three key aspects of autonomy; trajectory planning, trajectory following and collaboration of the two vehicles. Using the differentially-flat dynamics property of the system, the trajectory optimization is posed as a non-linear constrained optimization within the output space in the virtual domain, not explicitly related to the time domain. A suitable parameterization using a virtual argument as opposed to time is applied, which ensures initial and terminal constraint satisfaction. The speed profile is optimized independently, followed by the mapping to the time domain achieved using a speed factor.

KEYWORDS: Quadrotor, Ground Robot, Cooperation, Localization System, Quanser, Optitrack cameras, linearization, LQR, Waypoint Navigation, Direct method, Trajectory Generator, Trajectory Following, Optimization, Inverse Dynamics.

**DEVELOPMENT AND TESTING OF A HYBRID WHEG-MOBILE
PLATFORM FOR AUTONOMOUS SURF-ZONE OPERATIONS**

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Master of Science in Applied Physics–December 2011

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Second Reader: Peter P. Crooker, Department of Physics

In this thesis, we change the previous (wheel leg) Whег mobile platform design to incorporate a tail while simultaneously addressing both previous and future challenges of preparing the platform for amphibious operations. Modeling has shown that the benefit of replacing the rear set of Whегs with a tail is an increased ability to traverse higher obstacles based on the shift of the center of mass forward. Additional benefits of such changes lie in the ability to use the tail for self-righting modes should the platform end up inverted.

One of the main challenges of previous Whег mobile platforms was the vibrations the platform experienced as a result of the means of mobility. The vibrations were problematic for certain parts of the mechanical structure as well as decreased the reliability of the power distribution system. A suspension was added to the platform in attempt to damp accelerations experienced within the main chassis to allow for future upgrades in processing and sensors. The second main challenge of previous Whег mobile platforms was the challenge of

upgrading internal hardware for future flexibility as well as to facilitate a more efficient use of power to aid in increased on-station times and internal temperatures control.

The future challenges of adding the tail involved tail integration and amphibious operation preparation. In regards to tail integration, development of the different tail functions were examined as well as how those functions could be sensed and actuated. Amphibious operation preparation required special attention to physical boundaries as well as an examination into the heat generation of the different hardware.

KEYWORDS: Wheg mobile platform, Surf-Zone robotics, Robotic suspension systems, Quasi-closed robotic environmental system, Robotic power distribution, Rapid prototyping

ION TRAP QUANTUM COMPUTING

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Co-Advisor: Ted Huffmire, Department of Computer Science

Richard Feynman first proposed the idea of quantum computers thirty years ago. Since then, efforts have been undertaken to realize large-scale, fault-tolerant quantum computers that can factor large numbers much more quickly than classical computers, which would have significant implications for computer security. While there is no universally agreed upon technology for experimentally realizing quantum computers, many researchers look to ion traps as a promising technology. This thesis focuses on ion traps, how they fulfill the Divincenzo criteria, what obstacles must be overcome, and recent achievements in this field. We examine the physical principles of a linear Paul trap, including the confining potential and its quantum dynamics. In addition, we built a mechanical analogue of an ion trap for pedagogical purposes, and we provide an analysis of its trapping potential and compare it to a real ion trap, the Paul trap. Furthermore, we provide guidance for building a course module on ion trap based quantum computing; our guidance is based on course materials from several institutions.

KEYWORDS: Ion Trap, Quantum Computing

nanotubes and the counter electrode during field-ionization. The design emphasizes user-friendly operation by simplifying the sample exchange and by reducing the chamber volume under vacuum for a faster turn-around time between experiments. The proposed design is highly modular, allowing for easy installation of additional analytic capabilities and other future upgrades.

Keywords: carbon nanotube, ion thruster, nanosatellite, test chamber

MASTER OF ASTRONAUTICAL ENGINEERING

DESIGN AND INSTALLATION OF A FIELD IONIZATION TEST CHAMBER FOR ION THRUSTERS

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B.S., United States Naval Academy, 2003

Master of Science in Astronautical Engineering—December 2011

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Aerospace Engineering and Department of Physics

Second Reader: Oscar Biblarz, Department of Mechanical and Aerospace Engineering

The use of carbon nanotube arrays for field ionization in ion thrusters allows for a substantial reduction in thruster size and weight. The availability of miniature ion thrusters may enable the development of a suitable propulsion system for nano- and picosatellites, and can realize substantial weight, volume and cost savings in existing satellite platforms.

This research focuses on the design of a field ionization test chamber that can be used to determine a comprehensive performance metric for the carbon nanotube field ionization micro-ion thruster (CNT-FIMIT). Using the knowledge gathered from two previously employed test chamber designs, a third generation apparatus with higher precision and improved capabilities is constructed. This new design incorporates a mass flow controller for propellant flow rate measurements, a high-voltage source-measure unit for ionization current measurements, and a linear shift with position feedback for adjusting the distance between the carbon nanotubes and the counter electrode during field-ionization. The design emphasizes user-friendly operation by simplifying the sample exchange and by reducing the chamber volume under vacuum for a faster turn-around time between experiments. The proposed design is highly modular, allowing for easy installation of additional analytic capabilities and other future upgrades.

NEAR-STALL MODAL DISTURBANCES WITHIN A TRANSONIC COMPRESSOR ROTOR

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Co-Advisor: Garth V. Hobson, Department of Mechanical and Aerospace Engineering

This research effort seeks to better understand non-periodic flow characteristics for a forward swept axial transonic compressor rotor when operating near stall. Improved performance of a military gas turbine engine may be achieved by better understanding the mechanisms responsible for near-stall non-periodic disturbances within a transonic compressor rotor.

Using pressure transducers, embedded within the rotor wall casing, data were acquired and calibrated at various speeds up to 90% of maximum rotation velocity. Within the 90% design speed, various data sets were acquired for different throttle configurations. A new method to post-process the data to allow better investigating of the non-periodic flow characteristics was developed. Using Fast Fourier Transforms, two distinct and dominant frequencies were identified and analyzed. Contour pressure distribution maps for varying throttle configurations; and the amplitude differences for each frequency of interest was generated to illustrate correlations in frequency strength and its relationship with tip-leakage vortices, normal/oblique shocks, and

passage-to-passage interactions.

This study uses effective instrumentation and robust data reduction techniques to successfully identify passage-to-passage distribution of non-periodic and periodic low dominant frequencies within the rotor blade passage prior to stall.

KEYWORDS: Transonic, Compressor, Pressure Instability, Low Dominant Frequencies, Turbomachinery, Near-Stall Disturbances.

SPACE-BASED TELESCOPES FOR THE ACTIONABLE REFINEMENT OF EPHEMERIS SYSTEMS AND TEST ENGINEERING

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Master of Science in Astronautical Engineering—December 2011

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Co-Advisor: James H. Newman, Space Systems Academic Group

This thesis presents the results and activities related to the design, analysis, construction, test, and integration of a flight-qualified satellite, the Space-based Telescope for the Actionable Refinement of Ephemeris (STARE) satellite. This project has been collaboration, led by Lawrence Livermore National Laboratory (LLNL) and including the Naval Postgraduate School (NPS) and Texas A&M University. Of particular importance are the processes, experiences, and results of testing the payload and integrated STARE satellite. In addition, an analysis of testing requirements specifically appropriate for CubeSats, has been performed based on experience with larger satellites, and, finally, a thermal model has been developed for on-orbit thermal performance evaluation. The STARE satellite is currently scheduled to be a secondary payload mounted in the NPS CubeSat Launcher (NPSCuL), attached to the Atlas V Aft Bulkhead Carrier (ABC) on the Centaur upper stage. The goal of the STARE project is to improve Space Situational Awareness and, once the concept is validated, to develop a constellation that would be able to deliver highly refined optical data to improve current conjunction analysis.

KEYWORDS: 3U, CubeSat, Colony 2 Bus, NPSCuL, Atlas IV, Naval Postgraduate School, P-POD, OUTSat, Satellite, Space Systems, Testing, Test Plan, Thermal Vacuum, TVAC, Thermal Model, NX-6 I-deas, ABC.

NUMERICAL MODELING OF ION DYNAMICS IN A CARBON NANOTUBE FIELD-IONIZED ION THRUSTER

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Master of Science in Astronautical Engineering—December 2011

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Advisor: Marcello Romano, Department of Mechanical and Aerospace Engineering

Second Reader: Oscar Biblarz, Department of Mechanical and Aerospace Engineering

Carbon nanotube field ionization technology has the potential to make ion propulsion feasible for use in micro- and nano-satellites. To better understand the phenomenon and optimize the ion thruster design, it is useful to have an accurate model of the system. Numerical modeling of large-scale electron bombardment ion engines is a relatively mature field, but modeling of field-ionized ion engines is in its infancy. A simpler code may be appropriate for the early modeling stages of carbon nanotube field ionization technology; one such software package is spiffe. Spiffe is intended for modeling axisymmetric radio frequency guns, but it contains all the code necessary for basic modeling of ion optics in a field-ionized ion thruster.

This work analyzes the feasibility of spiffe software for use in modeling field-ionized ion thrusters. It also provides detailed procedures for its use. In this work, spiffe is first verified to agree with theoretical predictions of limits in a one-dimensional approximation using electrons. Two primary geometries and their boundary

conditions are investigated. The geometry is then varied to test the limits of the one-dimensional approximation. This was further altered to simulate singly-charged Argon ions and verified against theoretical one-dimensional limits.

A supplemental user's guide was developed to aid students with minimal programming experience to quickly become familiar with the methods used in spiffe and the impact of program options on the results. A guide to quickly post-processing the data was also developed.

KEYWORDS: numerical modeling, field ionization, carbon nanotube, CNT, spiffe

FLUIDICALLY AUGMENTED NOZZLES FOR PULSE DETONATION ENGINE APPLICATIONS

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Master of Science in Astronautical Engineering—December 2011

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Second Reader: Anthony Gannon, Department of Mechanical and Aerospace Engineering

Pulse Detonation Engines (PDE) operate in a cyclic manner resulting in large changes in the combustion chamber pressure. The widely varying pressure ratio between the chamber and nozzle exit makes it difficult to efficiently produce thrust since a fixed area ratio exhaust nozzle would operate off design nearly the entire cycle. Therefore, a nozzle with the capability to create the necessary area ratio throughout the cycle is required to produce an effective and efficient thrust profile. A dynamically varying nozzle was evaluated which investigated the possibility of using air injection into the diverging portion of the nozzle in order to effectively adjust the nozzle's exit area and provide the primary engine combustion products the most efficient area ratio throughout the combustion cycle. A two-dimensional nozzle and combustion section was created and simulated using computational fluid dynamics software to analyze the flow for various air injection pressures and velocities. A test section was designed and assembled for actual testing of the nozzle with the air injection ports and used a shadowgraph technique to observe the time-varying gas dynamics in the nozzle. The results of each were compared and analyzed to determine the validity of the CFD analysis. Subsequent computational analysis was conducted to find the most optimal injection conditions to achieve the most effective variable nozzle design for maximizing the impulse per cycle.

KEYWORDS: Pulse Detonation Engines, PDE, Variable Nozzles, Fluidic Variable Nozzles

FREE-ELECTRON LASER (FEL) UTILIZATION IN SPACE APPLICATIONS (SHIP-BORNE POINTING ACCURACY, DEEP-SPACE COMMUNICATIONS, AND ORBITAL DEBRIS TRACKING)

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Master of Science in Astronautical Engineering—December 2011

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Co-Advisor: William Colson, Department of Physics

Associate Advisor: Jae Jun Kim, Department of Mechanical and Aerospace Engineering

Associate Advisor: James Newman, Space Systems Academic Group

The US Navy is currently conducting research which will support the production of a MW-class free-electron laser (FEL). The Navy's end-state goal is to design and implement a defense system capable of destroying a fast-flying, anti-ship cruise missile (ASCM) target. To this end, the necessity of ensuring accurate pointing control of the beam is required. The first part of this thesis focuses on the US Navy's desired end-state and investigates the ability of feedback and feed-forward control methods to provide improved pointing accuracy

to a beam director mounted on a naval vessel similar in size to that of a Ticonderoga-class cruiser while traversing through various sea-states. The second part of this thesis examines the feasibility of employing the FEL as a means of deep-space (Mars and beyond) communication and orbital debris removal and tracking of objects in low-earth orbit (LEO).

KEYWORDS: Free-Electron Laser, FEL, Pointing Accuracy, Space Communications, Orbital Debris Removal, Orbital Debris Tracking

MASTER OF COMBAT SYSTEMS TECHNOLOGY

DESIGNING AN ELECTRONIC READOUT FOR A DIRECTIONAL MICRO ELECTRO-MECHANICAL (MEMS) SOUND SENSOR

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Master of Science in Combat Systems Technology—December 2011

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Second Reader: Roberto Cristi, Department of Electrical and Computer Engineering

Locating sound sources has been of interest to the military, especially in locating sniper fire in an unconventional operational theater. Today, there are such systems to localize snipers, but they are bulky, heavy and do not employ networking, which can greatly improve the performance in terms of accuracy and reliability. Hence, there is a need to design a system that is small, compact, distributed, and reliable. In this project, an electronic readout system was designed and integrated for a directional Micro Electro-Mechanical (MEMS) sound sensor that is being developed in Naval Postgraduate School, Physics department. It is composed of the hardware and software components to process sensor signals such as amplitudes and frequencies, to aid in determining the direction of the sound. To keep the system small and compact, the electronics readout was integrated to the sensor system on the same platform. Such electrical and mechanical system integration minimizes the parasitic capacitances and enhances the sensitivity. The measured sensor response using the integrated electronics showed an improvement of nearly a factor of four larger as compared to that using an external circuit board.

KEYWORDS: MEMS, Electronic Readout

CALCULATION OF THE TRANSITION MATRIX FOR THE SCATTERING OF ACOUSTIC WAVES FROM A THIN ELASTIC SPHERICAL SHELL USING THE COMSOL MULTIPHYSICS FINITE-ELEMENT CODE

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Master of Science in Combat Systems Technology—December 2011

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Second Reader: Clyde L. Scandrett, Department of Applied Mathematics

In acoustics, the so-called Transition, or T-matrix relates the incident and scattered acoustic pressures of an object or scatterer. The T-matrix of a thin steel spherical shell in water has been determined by the COMSOL Multiphysics Finite-Element Code. The shell has an outer radius of 0.5m and a thickness of 1cm. It is driven at a frequency of 474 Hz such that $ka=1$ (where k is the acoustic wave number and a is the outer radius of the shell). A standing wave, represented by a spherical Bessel function, is incident onto the shell surface and the

corresponding scattering coefficient is computed.

The approach is divided into three portions. Firstly, a fluid-loaded rigid sphere is modeled using the Acoustic-Shell Interaction (ACSH) physics mode to examine the functionality of COMSOL. It also explores the degree of improvement when a refined fluid mesh is applied. Secondly, a thin spherical shell is modeled in the ACSH physics mode. This will examine the credibility of COMSOL to obtain accurate results based on thin shell approximation. Finally, a true 3D finite element, employing the 3D elastic theory, is created using the Acoustic-Structure Interaction (ACSI) physics mode.

The resulting diagonal T-matrix elements achieved an accuracy of 0.1% relative to the analytical T-matrix. Ultimately, these results will be applicable to the modeling of the radiation from an arbitrarily densely-packed array of sonar transducers.

KEYWORDS: T-matrix, Thin Shell, 3D Elastic, Diagonal Elements, Acoustic-Shell Interaction, Acoustic-Structure Interaction, Scattering, COMSOL

TRANSPORT IMAGING OF MULTI-JUNCTION AND CIGS SOLAR CELL MATERIALS

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Multi-junction solar cells are an emerging technology that improves the conversion rate of solar energy. Indium Gallium Phosphide (InGaP) is commonly used as the top cell in multi-junction cells grown on Germanium (Ge) or Gallium Arsenide (GaAs) substrates. To design more efficient solar cells using InGaP, it is important to characterize its transport parameters, particularly, the minority charge carrier mobility, diffusion length and lifetime as a function of doping and material growth conditions.

In this work, transport imaging was performed on a set of InGaP heterostructures (with differing thicknesses, doping levels and minority carrier types) to determine their minority carrier diffusion length. These measurements, together with an independent set of time-resolved photoluminescence (TRPL) lifetime data, were used to calculate the minority carrier mobility values. For the shortest diffusion lengths, experimental limitations were encountered involving the finite carrier generation volume. Simulations were performed to explore the potential of modeling the convolution of diffusion behavior with a finite generation region to address these limitations.

Transport imaging was also performed on a set of Copper Indium Gallium Selenide (CIGS) materials. Polycrystalline CIGS represents an alternative to the expensive single-crystal InGaP. These initial experiments identified the challenges of applying transport imaging to polycrystalline materials.

KEYWORDS: Transport Imaging, Solar Cells, InGaP, CIGS, Minority Charge Carriers, Diffusion Length, Minority Charge Carrier Mobility

THE ROLE OF GENERATION VOLUME AND PHOTON RECYCLING IN “TRANSPORT IMAGING” OF BULK MATERIALS

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Second Reader: Peter P. Crooker, Department of Physics

The goal of this research was to use Monte Carlo simulations to further develop the model that describes

transport imaging by including a more realistic description of the generation region created by the incident electrons. Monte Carlo simulation can be used to determine the energy distribution in bulk materials due to incident electrons. In the simulation, the incident electrons undergo both elastic and inelastic scattering events. Through these events, the energy of the electrons is transferred to the target materials. This deposited energy can generate electron-hole pairs and then, via recombination, photons. In experimental works, these photons are measured by a CCD camera connected to an optical microscope in a scanning electron microscope (SEM).

Monte Carlo simulations were performed for a range of target materials and compared to the luminescence distributions measured experimentally. The simulated energy distributions are always spatially narrower than the optical image from the SEM. We propose possible explanations need to be reevaluated; the relationship between deposited energy and final electron distributions in the target material and photon recycling, in which locally generated photons are reabsorbed to produce a wide luminescence distribution. Further experiments are proposed to identify the limiting factors determining the minimum luminescence distribution.

KEYWORDS: Nuclear detection system, transport imaging, Monte Carlo simulation, CASINO

MASTER OF SCIENCE IN COMPUTER SCIENCE

IMPLEMENTATION OF AUTONOMOUS NAVIGATION AND MAPPING USING A LASER LINE SCANNER ON A TACTICAL UNMANNED VEHICLE

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Second Reader: Duane Davis, Department of Computer Science

The objective of this thesis is to investigate greater levels of autonomy in unmanned vehicles. This will be accomplished by reviewing past literature and developing attaining components of software architecture that are necessary for unmanned systems to achieve greater autonomy.

The thesis will implement the software and hardware (laser range finder) on the Quadrotor for real-time obstacle detection and avoidance.

This will provide the means to critically evaluate the strengths and weaknesses of the MOOS-IVP autonomy architecture and provide insight into what is necessary to achieve greater levels of intelligent autonomy within unmanned systems.

KEYWORDS: AI, Obstacle Avoidance, Potential Field, Occupancy Grid, Quadrotor, MOOS-IVP.

A CYBERCIEGE TRAFFIC ANALYSIS EXTENSION FOR TEACHING NETWORK SECURITY

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Master of Science in Computer Science—December 2011

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Co-Advisor: John D. Fulp, Department of Computer Science

Co-Advisor: Michael F. Thompson, Department of Computer Science

CyberCIEGE is an interactive game simulating realistic scenarios that teaches the players Information Assurance (IA) concepts. The existing game scenarios only provide a high-level abstraction of the networked environment, e.g., nodes do not have Internet protocol (IP) addresses or belong to proper subnets, and there is no packet-level network simulation. This research explored endowing the game with network level traffic analysis, and implementing a game scenario to take advantage of this new capability. Traffic analysis is presented to players in a format similar to existing tools such that learned skills may be easily transferred to future real-world situations.

A network traffic analysis tool simulation within CyberCIEGE was developed and this new tool provides the player with traffic analysis capability. Using existing taxonomies of cyber attacks, the research identified a subset of network-based attacks most amenable to modeling and representation within CyberCIEGE. From the attacks identified, a complementary CyberCIEGE scenario was developed to provide the player with new

educational opportunities for network analysis and threat identification. From the attack scenario, players also learn about the effects of these cyber attacks and glean a more informed understanding of appropriate mitigation measures.

KEYWORDS: Information Assurance, Network Security, Traffic Analysis, CyberCIEGE, Training

LEARNING MANAGEMENT PLATFORM FOR CYBERCIEGE

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Co-Advisor: Mike Thompson, Department of Computer Science

In order to enhance the usability of the CyberCIEGE to assess the student's learning experience and achievement of the scenario objectives. This thesis investigated how to improve the current student assessment module, report generation process, report format and also integrating of CyberCIEGE with Naval Postgraduate School's (NPS) Learning Management System (LMS). Based on the researched, enhancements such as additional summary view on Event Log Analyzer with game selection features, report generation feature on the Campaign Analyzer, various levels of reports and the process of linking to the Collaborative Learning Environment (CLE) was implemented.

KEYWORDS: CyberCIEGE, Computer Science, Assessment Module, Learning Management Platform

EVALUATING THE RECORD OF THE COALITION PROVISIONAL AUTHORITY'S MACROECONOMIC REFORMS IN IRAQ

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Master of Science in Computer Science—June 2003

Master of Arts in National Security Affairs

Advisor: Robert Looney, Department of National Security Affairs

Second Reader: Ralph Porch, Department of National Security Affairs

This thesis measured three aspects of the Coalition Provisional Authority's macroeconomic reforms for transitioning Postwar Iraq; the degree of Central Bank independence; the success of the currency exchange; and whether the program of shock therapy weakened macroeconomic reforms. The premise behind implementing liberal economic reforms in Iraq was that creating a market-oriented economy would increase internal stability and would integrate Iraq into the global economy. Moreover, an integrated Iraqi government would be less likely to engage in hostile action against its own population or its neighbors. This thesis scored the actual degree of Central Bank independence at .64 according to the most widely accepted measure established by Cukierman, Webb and Neyapti. This thesis also proved the CBI effectiveness at targeting inflation, which is another indicator of central bank independence. The CPA's program of dinar consolidation unified Iraq's dual monetary system and helped erase Saddam's legacy of economic incompetence. The goal of shock therapy was to avoid the obstruction and interference that might have accompanied a protracted step-by-step approach. Rather than being rejected by a popular backlash or overturned by the Iraqi government, the CPS's macroeconomic reforms remain vital. Although these reforms did not resolve all the structural hurdles in the economy, this research finds that the CPA's neoliberal economic policies have created the necessary groundwork for the further development of independent macroeconomic institutions.

KEYWORDS: CPA Iraq Macroeconomic Reform Dinar Stabilization

**A CYBERCIEGE SCENARIO ILLUSTRATING PKI INTEROPERABILITY ISSUES
THROUGH E-MAIL COMMUNICATIONS IN A CORPORATE ENVIRONMENT**

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Thesis Co-Advisor: J.D. Fulp, Department of Computer Science

Thesis Co-Advisor: Mike Thompson, Department of Computer Science

To help educate computer/network users and administrators on the complexities and potential implementation pitfalls of PKI, the work outlined in this thesis extended the CyberCIEGE computer security simulation game with additional PKI-related functionality. The research developed a scenario definition file for the CyberCIEGE game engine that supports a new game scenario that illustrates PKI concepts (e.g., cross-certification, certificate path processing and certificate revocation), configuration choices, and the security implications thereof. The game engine was enhanced to realistically model the parameters of an actual X.509 digital certificate. Test cases designed for this game extension verified that the scenario reasonably portrayed realistic PKI deployment issues and provided feedback consistent with real-world PKI implementations.

KEYWORDS: Public Key Infrastructure (PKI), X.509 Certificate, Certificate Revocation, Certificate Path Processing, CyberCIEGE, Computer security education

MASTER OF SCIENCE IN CONTRACT MANAGEMENT

ACQUISITION WORKFORCE STRATEGY: THE CHALLENGE THE DEPARTMENT OF DEFENSE FACES TO IMPROVE ITS ACQUISITION WORKFORCE

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Master of Science in Contract Management–December 2011

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The objective of this project is to examine the Department of Defense's (DoD's) FY 2010 Acquisition Workforce Improvement Strategy. The project will outline developments that generated the need for DoD's Acquisition Workforce Improvement Strategy and DoD's efforts to address its acquisition workforce's ability to manage and oversee its services contracts. This project will also examine the implementation and effectiveness of DoD's acquisition workforce improvement initiatives to see if plans will meet intended higher-level directives. The result of this project will enhance acquisition personnel's understanding of the DoD's Acquisition Workforce Improvement Strategy and the initiatives that impact acquisition workforce.

KEYWORDS: Acquisition Workforce, Workforce Improvement Strategy

MASTER OF SCIENCE IN DEFENSE ANALYSIS

THE IRANIAN CENTURY: THE TENSION BETWEEN IRAN AND THE GULF STATES

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The Arabian Gulf represents a significant part in the world because of its oil wealth. During the last thirty years, three wars have taken place in the region resulting in regional and global instability: the Iran-Iraq war; the Persian Gulf War of 1990–1991, and the U.S. led invasion of Iraq in 2003. The fall of Iraq made Iran more powerful in the region, and as a domination strategy, Iran launched its nuclear program. Iran represents a major power in the region; it can destabilize the regional balance even more if it controls nuclear weapons, marking a potential arms race in the region. Iran's nuclear program is threatening the stability of the region. The highest priority is to make the Gulf region free from weapons of mass destruction by all available means. The Gulf States, the Kingdom of Saudi Arabia (KSA), Kuwait, Bahrain, Oman, the United Arab Emirates (UAE) and Qatar should work collectively to defend their interests. In an unpredictable world, a power vacuum could arise at any time in the region, especially when the United States withdraws from Iraq. More cooperation and coordination through the Gulf Cooperation Council (GCC) could help the Gulf States develop the capacity to play a larger role in their region.

KEYWORDS: Gulf States, U.S., Iraq, Iran Nuclear Program, Gulf Security, GCC, Tensions

HELP A BROTHER OUT: A CASE STUDY IN MULTINATIONAL INTELLIGENCE SHARING, NATO SPECIAL-OPERATIONS FORCES

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This thesis examines how to optimize intelligence sharing in a coalition by a thorough literature review and site visits to intelligence sharing organizations in order to establish best practices for multinational intelligence sharing. The newly established NATO SOF Headquarters (NSHQ) in Mons, Belgium was treated as a test case to validate their intelligence sharing procedures and structures in reference to the authors' identified best practices: mutual gains and benefits; trust; direct control; and accessibility and interoperability.

Intelligence support to SOF is a *decisive* factor, when in conventional operations it often is not; therefore intelligence support to SOF is special - NATO SOF is no exception. The level of intelligence support to SOF

normally only exists at the national level, due to bureaucratic obstacles, a need to protect sensitive sources and capabilities, and lack of trust. The NSHQ is experimenting with several innovative methods to enhance trust and streamline intelligence capability amongst NATO SOF forces. There are structural and organizational lessons learned from the establishment of the NSHQ that can be applied to future operations and coalitions.

KEYWORDS: NATO SOF, NSCC, NSHQ, Special Operations Interoperability, Military Networks, NATO Transformation, European Common Threats, NATO Training and Education Program-NSTEP, BICES Network, Afghanistan Special Operations, ISAF SOF, Intelligence Sharing, Multinational Operations, Intelligence, Coalitions.

THE FAULTS OF THE GENERALS: HOW GREAT BRITAIN LOST THE WAR FOR AMERICA

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By 1778, the world's most powerful Empire had failed, for almost four years, to decisively end an internal rebellion in its North American colonies. This failure resulted in the escalation to a world war and the British submitting to defeat in 1783. What is of interest is not the international community's impact on the outcome of the American Revolution, rather how the British military continually missed the opportunity to end the rebellion in its nascent phase. Therefore, this research will explore the strategic interaction between the British military, the patriots and the American colonists to determine what British military commanders' decisions contributed to these missed opportunities, and the ultimate loss of their war for America. To illuminate what went wrong, this research will import the McCormick Diamond paradigm to sift through this field of history, framing the strategic decisions, the conditions under which they were made, and their effects on the overall British effort to quell the colonial rebels of North America.

KEYWORDS: American Revolution, McCormick Diamond, British Strategy

INSTITUTIONAL CHALLENGES TO DEVELOPING METRICS OF SUCCESS IN IRREGULAR WARFARE

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In irregular warfare (IW) conflicts, where winning the support of the population is often key, the United States military historically has demonstrated consistent difficulty in developing metrics that describe the effectiveness of its operations. We identify previously neglected aspects of the problem. More specifically, we

argue that the institutional pressures generated by a conflict's national imperative, when combined with the military's own bureaucratic characteristics, cause the military organization to focus on inappropriate measurements. This causes it to misinterpret the IW environment and therefore misjudge its operational effectiveness. Thus, the search for useful metrics of success in IW must seek to overcome not only the difficulties inherent to measuring IW, but endemic organizational characteristics of the U.S. military; understanding this heretofore neglected interactive effect is crucial to understanding the nature of the metrics problem in irregular warfare campaigns. We develop our argument and illustrate it using historical cases of U.S. IW campaigns.

KEYWORDS: Irregular Warfare, Metrics, Organizational Theory

COUNTERING RADICALIZATION: REFOCUSING COMMUNITY-ORIENTED POLICING RESPONSES TO VIOLENT EXTREMIST IDEOLOGY WITHIN THE UNITED STATES

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The Obama Administration designated the local community as the first line of defense against violent extremist radicalization in the United States. In doing so, they called on communities to utilize existing structures such as community policing and to draw on successful models such as the Department of Justice's Comprehensive Gang Model. Research to date, however, has not shown how this model should be adjusted at the local level to address the specific mechanics of radicalization within the United States. Insufficient attention has been paid to the specific mechanics of recruitment at the individual level within vulnerable communities at the front end of the radicalization cycle. The purpose of this thesis is to identify strategy options for community policing within Muslim populations to counter radicalization before individuals turn to violent means. Prevention programs need to act in the same way and at the same level as the violent extremist activists within the target population to be successful. In a time of budget cuts and reduced resources these options can allow the community to be a force multiplier in the creation and effectiveness of counter radicalization programs. This paper attempts to provide a strategy and framework upon which to base future counter-radicalization efforts.

KEYWORDS: Community Policing, Radicalization, Violent Extremist Ideology, Counter radicalization, Prevention Programs

KEEPING SPECIAL FORCES SPECIAL: REGIONAL PROFICIENCY IN SPECIAL FORCES

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Regional proficiency is a critical capability in irregular warfare (IW). In preparation for increased engagement in irregular warfare, the Department of Defense (DoD) and the Military Services made several significant improvements in developing regional proficiency. While the DoD is attempting to create a new capability in the majority of the Total Force, Special Forces was created to succeed in an IW environment. As a result of its design, Special Forces valued and developed regional proficiency long before this became topical in DoD. Oddly, the last decade of overseas contingency operations that spurred interest in regional proficiency in DoD overall has also threatened regional proficiency development in Special Forces. An analysis of Special Forces training and development reveals that the Special Forces' primary means of developing regional proficiency is through

deployment experience. While the Special Forces Groups are regionally aligned, several have consistently deployed outside of their Area of Responsibility (AOR) to support combat operations in Iraq and Afghanistan. A survey and a series of interviews were conducted to determine the state of regional proficiency interest in Special Forces. Through survey analysis, several trends were identified. With this information, this thesis concludes with a suggested strategy to improve regional proficiency in Special Forces non-commissioned officers (NCOs).

KEYWORDS: Special Forces, Regional Proficiency, Cultural Capability, 3C, Language, Cross-Cultural Competence, Doctrine, Irregular Warfare

GROWING AN IDEOLOGY: HOW THE MORMONS DO IT

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A fundamental characteristic of human interaction is the manifestation of ideology, which, as we define it, transcends religious, political, cultural, and national realms. Differing ideologies among groups can create friction, and often incite violence. This study seeks to understand how groups adhering to particular ideologies grow, for understanding ideological promulgation is an imperative step in understanding conflicts arising from conflicting ideological principles. We accomplish this by exploring one of the fastest growing ideologically distinct organizations today, the Church of Jesus Christ of Latter-day Saints (LDS). In doing so, we propose that the LDS's institutional framework enables not only efficient resource collection, but also frames and promotes a socialization structure that enables ideological growth. This supports empirical evidence which suggests that ideology plays a secondary role in an ideological organization's growth. Implicit in this argument is that to promote an ideology, one should focus on *socialization* rather than the ideology itself; likewise, effectively countering an ideology requires a focus on social bonds and not necessarily a counter-ideological message.

KEYWORDS: ideology, ideological, philosophy, belief, choice, behavior, doctrine, religion, religious, religiosity, church, Mormon, Church of Jesus Christ of Latter-day Saints, organizational structure, organization, bureaucratic, community, culture, demographics, relationships, social, socialization, commitment, consumption, growth, expansion, market, economies, plural, resources, secularization, theory, special operations, counterinsurgency, de-radicalization

HOW TO DETER AND COERCE IRAN INTO GIVING UP ITS NUCLEAR WEAPONS PROGRAM

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The feud between the U.S. and Iran has smoldered for over thirty years. Recently, Iran has witnessed popular support for reformists decline while government support for hardliners has increased. President Ahmadinejad has increased his rhetoric against Israel and the U.S. even as the U.S. changed administrations. Through it all,

Iran has apparently continued to pursue the acquisition of nuclear weapons, despite six United Nations Security Council Resolutions and billions of Iran's dollars frozen. Each progressive round of attempted negotiations results in little more than additional sanctions. It is time to question the U.S. approach and reevaluate the U.S. strategy of deterring Iran from pursuing nuclear weapons. This research develops a deterrence strategy for use against Iran based on the results of an inductive case study of Iran and the history of its nuclear energy and nuclear weapons program. By examining Iran and the history of its nuclear program and nuclear weapons program, the correct deterrence lens Iran should be viewed through will be deduced, and those entities that are most important for the nuclear weapons program will be identified. A deterrence strategy focused on those entities is then developed.

KEYWORDS: Iran, Nuclear, Nuclear Weapons, Proliferation, Deterrence, Strategy, Middle East Policy, Iran Policy, Coercive Diplomacy

MEASURING WHAT RIGHT LOOKS LIKE: A SYSTEM IN DEVELOPING METRICS FOR TACTICAL LEVEL UNITS

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Since the United States' involvement in Afghanistan in 2001 and Iraq in 2003, thousands of U.S. service members have been lost and millions of man-hours spent on patrols, cordon and searches, and killing or capturing high value targets (HVTs). Billions of dollars from Commander's Emergency Response Program (CERP) have been spent on humanitarian aid projects. Despite this investment, outcomes remain vague.

This thesis devises a system for employment by tactical units to develop metrics that determine outcomes in nation assistance. It begins by defining terms and models useful for metric development in nation assistance: rational-actor theory, McCormick's diamond model, the logic model, and correlation versus causation. The thesis then uses historical examples on metrics from Vietnam, Iraq, and Afghanistan. Next, data analysis of nation assistance operations is reviewed. Difficulties and shortcomings in these historical examples and methods are highlighted. Finally, the thesis covers the failed state index that forms the base of the system that develops metrics that determine outcomes. The tactical outcome assessment, was developed by operationalizing the failed state index for use by tactical units. The tactical outcome assessment is the system that tactical units can employ to develop metrics that determine outcomes in nation assistance.

KEYWORDS: Nation Assistance, Metrics, The Failed State Index, Rational Actor, McCormick's Diamond Model

THE SHOTGUN OR THE SCHOOLHOUSE? OPTIMAL STRATEGY TO ACHIEVE CANADIAN POLICY OBJECTIVES IN AFRICA

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This thesis investigates how the use of Canadian Forces personnel employed in a security sector reform context within fragile states may best achieve stated government of Canada (GoC) policy objectives on the con-

tinent of Africa. Two established constructs will be considered. The first is “the schoolhouse,” based on the United Kingdom-led International Military Assistance Training Team (Sierra Leone) involving a centralized team of advisors and trainers. The other is “the shotgun,” based on CF member employment within United Nations African missions (UNAMID, MONUSCO, and UNMISS) involving individual member augmentation spread throughout these UN organizations. The thesis will consider if the differences in organizational processes and outcomes more or less effectively achieve GoC policy objectives. Finally, the thesis will suggest recommendations for policy and further study.

KEYWORDS: Security Sector Reform, Canada, Africa, Canadian Forces, Schoolhouse, IMATT, Sierra Leone, United Nations

THE UNITED STATES AND YEMEN: COIN IN THE ABSENCE OF A LEGITIMATE GOVERNMENT

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The problems Yemen faces today seem insurmountable. The geographic divisions widened by imperialism were cemented by Yemeni President Ali Abdullah Saleh. His heavy-handed suppression of the Houthi rebellion on the border with Saudi Arabia, the southern secessionist movement, and the Arab Spring protesters delegitimized the regime in the eyes of the Yemeni people. With President Saleh at the helm, water and oil resources were squandered and mismanaged. Al Qaeda in the Arabian Peninsula (AQAP) has found this volatile, ungoverned environment a welcome area in which to recruit, equip, train, and conduct operations. That their antagonistic narrative continues to find a welcome audience in the tribal areas of Yemen and their securing of safe havens is testament to the failed policies of the Saleh regime.

The United States has focused on eradicating AQAP since the beginning of the global war on terrorism (GWOT). In its counterinsurgency (COIN) campaign against AQAP, the United States has focused almost all its effort in working with the Yemeni government. While enjoying a modicum of success, this success has been limited to the elimination of AQAP operatives through kinetic strikes. Moreover, the gains were tempered by President Saleh, who at times acted in direct opposition to America’s goals of eradicating AQAP. His recent removal will likely do little to counter the array of problems Yemen faces.

In this light, America’s foreign policy toward Yemen and AQAP is inadequate in securing our regional interests and needs to be overhauled. To delineate which COIN practices may work best, an investigation of past COIN campaigns was conducted. Malaya, Nicaragua, and Somalia were chosen to provide the widest possible range of tactics used in fighting an insurgency where the host nation government is illegitimate, and represent both success and failure. These three case studies formed the basis of three courses of action: working with the government, circumventing the government and working directly with the tribes, and assisting in the state failure. While all three courses of action have merit, only the third course of action addresses the root causes of the problems in Yemen. For this reason, the only way to eliminate AQAP as a threat to the United States is to work through the Yemeni tribes without the central government acting as a roadblock.

KEYWORDS: Yemen, Saleh, Ungoverned Territory, Counterinsurgency, Counterterrorism, al-Qaeda, al-Qaeda in the Arabian Peninsula, Arab Spring, Galula, Kilcullen, Somoza, Nicaragua, Malaya, Somalia, Barre, Unconventional Warfare, Special Operations Forces, Insurgency.

**THE STICKY SUBJECT OF RELIGION: CAN IT EVER
BE THE GLUE FOR A STABLE SOCIETY?**

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An assumption underpinning Western liberal democracy is that separation of religion and state always improves stability, and U.S. policy often encourages nations to move toward secular government structures. Yet, ethnically plural societies may need a common identity for the nation to gel and religion might be the “glue” that can hold a society together. Recent nation-building efforts signal a need for greater understanding of how best to employ religion as a cross-cutting tie for social cohesion. This thesis examines Israel, Iran, and Turkey; each has varying ethnic and religious compositions and has attempted to use religion for domestic stability. While Israel and Iran validate religion’s cohesive power, all cases highlight the possible adverse effects of this approach. The findings of this thesis identify which political systems, religious contexts, population demographics, and/or political circumstances are most conducive for leveraging religion to aid domestic stability. We conclude that, while in many cases religion may increase volatility, in some circumstances religious glue may, actually, effectively bridge ethnic divisions to promote cohesion and stability. The most conducive conditions for this approach are when political systems protect minority rights and allow religion in the public sphere, but restrict the government from mandating religious practices.

KEYWORDS: Religion, religious identity, separation of church and state, religion-state differentiation, domestic stability, social cohesion, ethnic conflict, minority rights, minority issues, Israel, Iran, Turkey, Zionism, Islamic Republic, theocracy, Turkish-Islamic Synthesis, Islamism, Judaism

**FINDING THE RIGHT INDIGENOUS LEADER AND FORCE
FOR COUNTERINSURGENCY OPERATIONS**

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In recent decades, insurgencies and nonstate actors with their nontraditional styles of warfare have become a significant threat to the U.S. and its allies. Failing to draw from lessons learned of past conflicts has been a root cause of the misguided strategies implemented against the insurgents in both Iraq and Afghanistan. Combating these insurgencies using a military-heavy strategy has proven to be exhaustive on both the U.S. economy as well as the military forces who have shared the burden of deployments since the onset of operations Enduring Freedom and Iraqi Freedom. As a result, the U.S. must consider alternative strategies for dealing with insurgents that are both more tactically sound and less taxing on the economy and military. Using special-operations forces (SOF) to establish local indigenous security forces in under-governed areas is one means for accomplishing this goal. This thesis focuses on the importance of choosing the right indigenous leader and force for U.S. SOF to partner with to defeat insurgents through the establishment of security, governance, and development at the local grassroots level. A step-by-step process is described in this thesis that

will assist SOF units with how to choose the best local indigenous force leader (LIFL) and how to train him and his force. Also discussed is the importance of maintaining that partnership until the LIFL and his force are capable of operating unilaterally, and lines of support and communication have been opened with higher levels of the host nation government.

KEYWORDS: Counterinsurgency, Indigenous Force Leader, militia, training indigenous forces, indigenous force assessment and selection

COUNTERING AL-SHABAAB: A CASE TO MINIMIZE TRANSNATIONAL TERRORIST THREATS AGAINST UGANDA

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This thesis analyzes the first transnational terrorist attack by Al-Shabaab in Kampala, Uganda, on July 11, 2010. It provides a historical background of Al-Shabaab since its inception and the group's major chronological events from 2006 to 2010. The study then analyzes the factors that may have contributed to Al-Shabaab joining the transnational arena to strike hundreds of miles away from Somalia.

Among the findings of the study is that the recruitment of foreign fighters by Al-Shabaab from different parts of the world materialized into the recruitment of Ugandans who acted as a local franchised cell inside Uganda. It was that cell that was responsible for the Kampala bombings. Moreover, the local franchised cell had logistic support links with other terrorist cells outside Uganda. In addition, porous borders facilitated the perpetrators to easily enter Uganda with all the materials that were used in the bombing.

Recommendations include that, together with intensifying human intelligence among the indigenous population in Uganda, the East African Community has to establish a strong counterterrorism agency incorporating all member states for information sharing in order to thwart cross-border terror networks.

KEYWORDS: Transnational terrorist attack, porous border, franchised cell, cross-border terror networks, control, Somali community, foreign terrorists, international terrorist cell, locus of violence, active support, passive support, indigenous population, and military repression.

RETURN ON INVESTMENT: ENSURING SPECIAL FORCES CAN FIGHT ANOTHER DAY

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The purpose of this research is to identify possible cultural and policy changes within the Special Forces Regiment that can elongate the operational lifespan of a special-forces operator through improved physical conditioning and recovery. Since inception, special-forces soldiers have conducted operations differently from any other soldiers or service members. These differences are not only in the types of operations or missions themselves, but in frequency, duration, austerity, and level of resources. As special-forces soldiers have continued to succeed at the challenges set before them, many have prematurely worn their bodies down and become less than fully physically capable to continue in their highly demanding field of work. In the situations where these exceptional Soldiers are removed from an operational role, their units lose the vast amount of experience that the individual Soldier had, and need to use additional resources training a replacement. This thesis argues

that improving the special-forces regiment's focus on physical readiness through some slight cultural and policy changes can significantly decrease the inevitable losses of Special Forces Soldiers to operational units, and allow the individual Green Beret to remain at a healthy state throughout his career and beyond.

KEYWORDS: Physical Readiness Training (PRT), National Academy of Sports Medicine (NASM), Special Operations Forces (SOF), Special Forces (SF), Tactical Human Optimization, Rapid Rehabilitation and Re-conditioning (THOR3)

THE PAKISTANI-U.S. ALLIANCE IN THE FIGHT AGAINST TERRORISM: A COST-BENEFIT ANALYSIS

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The cost-benefit equation of the Pakistani–U.S. alliance, in the fight against terrorism, reflects a direct correlation between the fluctuating patterns of U.S. assistance and their direct and indirect implications for Pakistan. While the U.S. strives to achieve a better return on its investment through military-oriented support, Pakistan seeks to adopt an approach that suits both the U.S. and its own domestic and regional interests. This research traces the trend of Pakistani–U.S. relations, highlights the impact of the fluctuating U.S. aid in shaping perceptions, and provides a game theoretical analysis on the issue. Besides highlighting measures to achieve cost effectiveness through micro alliances, decentralization, accountability, and transparency in fund management, the study supports development of entrepreneurial culture and micro-alliances in Pakistan. More importantly, it provides an in-depth analysis of the military and population-centric approaches and their associated costs and benefits for the two countries. The research concludes by suggesting a more population-centric U.S. approach towards Pakistan to achieve a better return on investment besides laying foundation for a long-term strategic alliance. It suggests future research on the prospects and methodology of achieving a long-term partnership between the two nations.

KEYWORDS: Pakistan-U.S. Relationship, Cost-Benefit, Global War on Terror, U.S. Assistance, Return on Investment, Fund Management, Micro-Alliance, Entrepreneurship, Game Theoretical Approach, Perceptions and Realities, Military-Centric Assistance, Population-Centric Approach, Strategic Partnership, Regional Balance of Power, Implications for Pakistan, Interest Alignment, Long-Term Objectives, Stability.

DEFEATING DAVID: LOOKING BEYOND A MATCHED STRATEGY

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DEFENSE ANALYSIS

This thesis builds upon existing contemporary theories that attempt to explain the outcomes of asymmetric conflict. Specifically, this thesis uses Ivan Arreguín-Toft's strategic-interaction theory as a baseline to identify theoretical gaps that can not only help further explain asymmetric conflict outcomes, but also provide insight into developing the proper strategy for strong actors. Arreguín-Toft contends that when the strong actor employs the correct strategy then it will win over 75 percent of conflicts against a materially weaker adversary. This leads to a fundamental question: if the strong actor uses the correct strategy against a weaker opponent, then why do strong actors still lose nearly 25 percent of the time? In an effort to identify other key variables that help explain non-conventional war outcomes, this thesis evaluates case studies where the strong actor both won and lost an asymmetrical conflict after choosing the correct strategy. This study finds two other factors that are important to achieving victory in an asymmetric conflict. First, the strong actor must have a viable indigenous political authority to work by, with and through. This concept has little to do with political legitimacy. Instead, it focuses on the capacity of the host nation, with strong actor assistance, to synchronize its military and political effort to defeat the insurgency. Second, the strong actor must not only use restraint in applying direct military power, but it must also use the correct force: a cadre that is trained in conducting irregular warfare. As such, this thesis' conclusions are aligned with the belief that it is the host nation's war to win or lose—adhering to this principle provides the strong actor with the best chance of “defeating David” before losing its political will.

KEYWORDS: Insurgency, Philippines, Oman, France, Algeria, weak, strong, indirect, irregular warfare, matched strategy, special forces, SAS, Rothstein, Arreguin-Toft, Huk Rebellion, Dhofar Rebellion.

INFLUENCE: THE NEW WEAPON IN THE BATTLE FOR SOUTHEAST ASIA

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This thesis provides a background look at China's recent history from World War II to present day to examine how it is gaining influence in the South Pacific and Southeast Asia. China is determined to become a global power and increase its international standing in term of influence and Southeast Asia is the start point. This thesis will also examine different approaches the United States and China use to gain Influence and resources. In particular, this thesis will use math modeling and game theory to explore linkages between assistance and Southeast Asian influence.

This thesis examines how Chinese assistance is countering U.S. efforts in Southeast Asia and why the United States must win the battle. This thesis looks at the current U.S. policies toward China and Southeast Asia and explores possible options for the United States in the future and how China may try to take control of the South China Sea. This thesis will make recommendations as to how the United States could more effectively utilize its resources to keep China in check. The thesis will conclude with recommendation for future policy based on the research to determine if the United States can win the battle for Southeast Asia using influence.

KEYWORDS: China, influence, Southeast Asia, South Pacific, math modeling, game theory, assistance, South China Sea, Special Operations Forces, ASAEN, Joint Special Operations Task Forces-Philippines, Paracels Islands.

DEFENSE ANALYSIS

HOW TO STABILIZE FAILING STATES:

THE GOOD, THE BAD AND THE UGLY OF INTERNATIONAL INTERVENTION

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The international community is often challenged with stabilizing failing states that are incapable of providing security, health, food and water to their citizens. Humanitarian concern about starvation, rapes, massacres, and oppression of the vulnerable in these states must be addressed. These states may also provide safe havens for terrorists and other groups that become threats to global security. The international community establishes complex missions with both a “soft approach” of providing only humanitarian aid and a stronger version that exercises binding power over local stakeholders.

This thesis analyzes these complex international interventions and argues that missions with binding power are more successful. It begins with theoretical reasoning on why missions with binding power are expected to be successful and continues with empirical data through the comparison of 13 international missions in eight different countries. Five of these international interventions in three countries are reviewed in detail. The UNMIK and EULEX in Kosovo and UNOSOM in Somalia are considered as successful examples while the UNOSOM II and AMISOM in Somalia are failures.

Finally, this thesis analyzes the current situation in Yemen and provides policy recommendations by applying lessons drawn from the analysis and comparison of the case studies in Kosovo and Somalia.

KEYWORDS: Failing States, Complex International Interventions, United Nations, Kosovo, Somalia, Yemen, Binding Power of International Interveners.

THE “ROAD” TO SUCCESS: IMPORTANCE OF CONSTRUCTION ON RECONSTRUCTION IN CONFLICT-AFFECTED STATES

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The United States has spent over \$2 billion in the last six years to reconstruct and stabilize Afghanistan through the Commander’s Emergency Response Program (CERP). This effort is only one of several simultaneous programs attempting to stabilize Afghanistan using approaches including providing humanitarian aid, education, government and security reform, and construction. Construction often involves simple infrastructure development with tangible benefits including increased access, growing commerce and better security. Construction projects can also employ the local population and, if done correctly, develop a sense of community and social capital. What causes construction projects to miss the mark failing to result in creating a stable community?

This research compares four different construction programs including CERP, the National Solidarity Program (NSP), the United States Agency for International Development (USAID), and provincial reconstruction teams (PRT) to determine their potential impact on Afghan stability. It uses a combination of statistical regression, correlation, and geospatial and temporal analysis to compare completed construction with

recorded SIGACTs (significant acts) reported by U.S. forces and NGOs. The results imply that the identified stabilization programs are not using construction effectively to create social capital and stability.

KEYWORDS: Conflict-affected reconstruction, the Commander's Emergency Response Program (CERP), National Solidarity Program (NSP), United States Agency for International Development (USAID), Provincial Reconstruction Team (PRT), Non Governmental Organization (NGO), insurgency, popular support

THE SPREAD OF ISLAMIC EXTREMISM IN THE REPUBLIC OF MACEDONIA

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This thesis identifies and discusses the spread of Islamic extremism as a potential threat to the Republic of Macedonia. It examines how Islamic extremism spread within the Republic of Macedonia and what policies could reverse this trend.

Major political, economic, and legal changes in Macedonia have provided fertile ground for nontraditional Islamic ideologies. Although adherents to radical Islamic ideologies in Macedonia have used NGOs and charities as mobilizing structures, they were not able to create their own organization. For most Muslims in Macedonia, critiques and visions of contemporary radical Islamic ideologies are problematic. Findings also suggest that Muslims in Macedonia are most vulnerable to individual recruitment; the attempts of local Islamic extremists to mobilize a greater number of followers for collective action were unsuccessful. In Macedonia, Islamic extremist ideologies are not a reaction to secularism and modernism, nor do they defend religion. Thus, their activities in Macedonia can be categorized as forms of potential or marginal fundamentalism. This thesis suggests that nurturing a culture of questioning and debating may counter radical Islamic ideologies. Other policy recommendations for counterterrorism measures include fighting organized crime and application of social network analysis concepts.

KEYWORDS: Republic of Macedonia, Islamic extremism, spread, Wahhabism, Salafism, Islamism, ideology, terrorism

THE FILIPINO WAY OF WAR: IRREGULAR WARFARE THROUGH THE CENTURIES

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The Filipino way of war is the dominant irregular warfare strategy executed by the Filipino warrior throughout the centuries. Armed with severely limited resources, a strong fighting spirit, and deep traditions, the Filipino warrior has always had to look for another method of warfare other than direct and total war. This has led to the indirect path, the path of irregular warfare. This tradition, built upon a foundation of tribal warfare, shaped by resistance to Spanish and American colonization, and honed during the guerrilla campaign against the Japanese occupation, has emerged in the modern era as the predominant Filipino military strategy. Entering the 21 century, conflict in the Philippines has not been focused on external invaders, but on internal division. In this era, both government and anti-government forces have recalled their traditions and experiences

and predominantly used irregular warfare strategies, often through unconventional warfare, insurgency, or special operations. As external military influences wane, it is important to understand and prepare the Armed Forces of the Philippines for the future by understanding their past history, so that the Filipino warrior will be better prepared for tomorrow.

KEYWORDS: Philippines, Filipino, Irregular Warfare, Guerrilla Warfare, Strategy

EXPLOITING WEAKNESSES: AN APPROACH TO COUNTER CARTEL STRATEGY

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Second Reader: Marcos Berger, DoD Contractor

The thesis, “Exploiting Weaknesses: An Approach to Counter Cartel Strategy,” provided an in-depth case study analysis of Los Zetas transnational criminal network to gain an understanding on its weaknesses and vulnerabilities. The thesis utilized social movement theory to illuminate its mobilizing structure and key essential factors that make Los Zetas vulnerable to disruption. In addition, the study identified Los Zetas’ financial support structure to expose its insidious methods. Finally, the thesis utilized social network analysis and geographical information systems to gain an understanding of its organizational networks, deduce possible safe havens, and key terrain of Los Zetas. Ultimately, the employment of the aforementioned theories revealed essential vulnerabilities, which form the essence of a practical disruption policy recommendation against Los Zetas.

KEYWORDS: Government of Mexico (GoM), Los Zetas, Criminal Organization, Social Network Analysis (SNA), Geospatial Information Systems (GIS), Centrality, Key Player, Social Movement Theory (SMT), Political Process Model, Resource Mobilization, Finance, Disruption

THE BALLOON EFFECT AND THE MEXICAN HOMELAND SECURITY: WHAT IT MEANS TO BE THE WEAKEST LINK IN THE AMERICAS’S SECURITY CHAIN

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The sudden increase in crime and violence in some Mexican cities and regions has raised security concerns not only in Mexico, where President Felipe Calderon categorized these crimes as a threat to Mexican society, but also in the United States, where Department of Homeland Security head Janet Napolitano referred to stemming the violence as “vital to core U.S. national interests.” Mexico is concerned with the latent threat of violence spreading all over the nation, while the U.S. is trying to guard against spillover. Both governments are concerned by the increased violence and its impact on communities along the U.S.–Mexican border.

Because of its geopolitical location along the southern U.S. border, Mexico is susceptible to possible undesired effects of U.S. strategies. These unintended, second-degree consequences are known as “balloon effects,” after the airflow inside a balloon when constriction applied to one area sends pressure to another area in the balloon, thinning and weakening its wall. Since 2006, Mexico’s strategy for countering transnational organized crime and related activities has sent the balloon effect in two directions: first, inside Mexico, where

government actions have unbalanced the criminal structure, creating balloon effects inside Mexican territory; and second, within the U.S. while asking to escalate the Mexican effort to improve its anti-crime strategy with U.S. assistance has escalated conflict and led to a holistic strategy against transnational organized crime and related activities in the Americas.

KEYWORDS: Mexico, Balloon effect, Strategy, Homeland security, transnational organized crime, drugs, violence, Americas' security chain.

FUSION NODES: THE NEXT STEP IN COMBATING THE GLOBAL TERRORIST THREAT

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Implementing a proactive approach to deny, disrupt, and defeat terrorist networks that threaten U.S. national interests is a critical capability required by the U.S. government. The challenge arising from these threats stems from the semi- and non-permissive environments where U.S. freedom of action is reduced or non-existent. The purpose of this thesis is to propose a system that effectively integrates intelligence and operations in order to conduct a proactive method to global counter-terrorism (CT) operations in these arenas. This system is based on the Network Targeting Cycle- Find, Fix, Finish, Exploit, and Analyze (F3EA) utilized by USSOF most recently in Iraq and Afghanistan, but also in the recent past during the conflict in Vietnam and narco-terrorism operations in South America. The scope of this thesis is to examine how the U.S. military can develop a global CT approach using the F3EA process based on an interagency, allied, and host-nation collaborative environment.

KEYWORDS: Counter-terrorism, Fusion Node, F3EA, Targeting

OUR KAMPF: THE ROLE OF IDENTITY IN CONFLICT

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This thesis examines the elements of identity at the levels of the individual, the group/organization, and the nation-state. Understanding the role of identity at these levels of analysis should provide military leaders at all levels with the foundation for understanding why individuals join terrorist groups and insurgencies. With this understanding, leaders should be able to better develop engagement strategies to counter radical ideologies and to minimize the conditions that make populations susceptible to those ideologies.

KEYWORDS: Identity, Identity Construction, National Identity, Nation-state, Group Identity

**TRAVELING THE TERROR HIGHWAY: INFILTRATION OF TERROR
OPERATIVES ACROSS THE U.S. AND MEXICAN BORDER**

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Following the attacks of September 11, 2001, border security and immigration have received increased attention. Public and political scrutiny have elevated and changed the priority of border security and immigration enforcement; from migrant workers seeking employment to counter-terrorism. However, the question remains: if United States law enforcement and security agencies are unable to stop the smuggling of drugs and illegal migrants across the southwestern border between the U.S. and Mexico, is it possible to prevent terrorists from gaining unauthorized and unaccountable entry into the heartland of the U.S.? A corollary question is: given attempts to restructure the immigration enforcement policy and infrastructure to deter illegal entry of terrorists, will it still be possible and lucrative for terrorists to attempt to illegally cross the U.S.-Mexico border? This research seeks to explore existing conditions that may facilitate or increase the likelihood that terrorists would seek to infiltrate personnel across the U.S.-Mexico border.

KEYWORDS: Terrorism, Terrorist Organizations, Human Smuggling, Southwest Border, Mexico, Border Security

**AIR COMMANDO INTEL: OPTIMIZING SPECIALIZATION TRAINING FOR AIR
FORCE SPECIAL OPERATIONS COMMAND INTELLIGENCE OFFICERS**

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Since 1999, Air Force Intelligence officers have been trained, managed, and assigned in accordance with a 'generalist' approach to intelligence disciplines. Specialization is the exception, and intelligence officers are assigned to a variety of missions, disciplines, and commands in an attempt to "broaden" their experience and maximize exposure to various disciplines. Because of this approach, specialization training after completion of the Air Force intelligence-officer course has become crucial to intelligence officer success at the unit level. This research examines specialization training provided to intelligence officers assigned to Air Force Special Operations Command (AFSOC) flying squadrons. Information gathered through surveys and interviews of AFSOC squadron leadership, weapons officers, and intelligence officers, coupled with a detailed analysis of AFSOC Intelligence Officer responsibilities and training, was utilized to develop a web-based survey designed to measure intelligence officer performance at unit level AFSOC flying squadrons. The survey results were analyzed to determine areas of strength and weakness, and recommendations for optimizing specialization training were created from the survey results. Recommendations include actions to enhance intelligence at the individual and team level in AFSOC flying squadrons, minor modifications to specialization training, and an alternative intelligence career path which allows increased specialization is discussed.

KEYWORDS: Air Force Intelligence, Air Force Special Operations Command Intelligence, Specialization Training, 14N, Air Force Intelligence Officer, Intelligence Officer Training, AFSOC 14N performance

SHOOT, MOVE, COMMUNICATE, PURCHASE: HOW UNITED STATES SPECIAL FORCES CAN BETTER EMPLOY MONEY AS A WEAPON SYSTEM

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This thesis analyzes how well United States Special Forces (USSF) are employing money as a weapon system (MAAWS) in accordance with the current commander, International Security Assistance Force (COMISAF) guidance on counterinsurgency (COIN) contracting in Afghanistan. By analyzing the current ways USSF are employing MAAWS, specifically in southern Afghanistan, this thesis identifies friction areas (past, present, future) between guidance and employment at the special-operation task force (SOTF) level and below. Based on this analysis, this thesis provides recommendations to help reduce these friction areas and enable Special Forces tactical units to better employ money as a weapon system. The main recommendations focus on incorporating the Yoder three-tier model, modified to meet the needs of USSF and enhancing training on contingency contracting to educate SF commanders and soldiers designated to fill the role of contracting officer's representative (COR). These recommendations will enable special forces to better employ MAAWS in the future and greatly increase the effectiveness and efficiency of their contracting procedures.

KEYWORDS: United States Special Forces, USSF, contingency contracting, SF contracting, money as a weapon system, MAAWS, counterinsurgency contracting, COIN contracting, Special Operations Task Force - Kandahar, SOTF-KAF, SOTF, CJSOTF-A, SOTF contracting, contracting officer's representative, COR training

MASTER OF SCIENCE IN ELECTRICAL ENGINEERING

SOURCE LOCALIZATION IN A COGNITIVE RADIO ENVIRONMENT CONSISTING OF FREQUENCY AND SPATIAL MOBILITY

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Electrical Engineer—December 2011

Master of Science in Electrical Engineering—December 2011

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Cognitive radio presents a unique challenge to source localization in that the radio has the ability to adapt to the environment, thus rendering current localization techniques ineffective due to a shifting combination of spatial, frequency, and temporal parameters. For any localization scheme to be effective, it must be able to adapt over time as a cognitive radio adapts to its surroundings. In this thesis an extended semi range-based localization scheme is proposed to accomplish this task. The proposed scheme estimates the position of a cognitive radio using the collaborative spectrum sensing results of a wireless radio frequency sensor network in a cognitive radio environment. The central idea behind the proposed scheme is to exploit the relationships between spatial, frequency, and temporal parameters of the environment to solve for the position of the cognitive radio. The proposed scheme is modeled in the MATLAB programming language, and its efficacy is demonstrated through simulation. It is shown that over time the proposed scheme is capable of estimating the frequency band of operation and the location of a cognitive radio, and is thus capable of accounting for both frequency and spatial mobility inherent in the cognitive radio environment.

KEYWORDS: Cognitive Radio, Source Localization, Semi Range-Based Localization, Mobile Positioning, Wireless Sensor Networking

INVESTIGATION OF PROPAGATION IN FOLIAGE USING SIMULATION TECHNIQUES

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In a foliage environment, radio wave propagation is subjected to fading on both large-scales and small-scales that impair the quality and reliability of data link transmission. This has implications in many military applications. An example is the performance of communications links and unmanned aerial vehicle radio links when the ground forces are operating in foliage environments.

The purpose of this research is to evaluate some simple models for propagation of radio waves in foliage using an electromagnetic field simulation application.

The three dimensional (3D) electromagnetic field simulation application, CST Studio Suite, was used in the modeling and simulation process. Specifically, the CST Microwave Studio module was used to model the forest using dielectric blocks. Various combinations of forest dimensions, material dielectric parameters and

antenna placements were simulated to obtain propagation models of radio waves in foliage environment.

The simulation models are compared to three empirical models presented in the literature for propagation in foliage environment. Using the simulation model, we examined the coverage diagram for a transmitter antenna immersed in foliage. The results show that the proposed simulation models provide a rough approximation to radiowave propagation in an actual rainforest environment. Based on the simulated results, the path loss in foliage is affected by the forest's electrical characteristics, the height of the transmitter and the height of receiver.

KEYWORDS: Radio wave propagation, Foliage, Forest, EM wave simulation

PROPERTIES AND APPLICATIONS OF LOSSY METAMATERIALS

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The complex permittivity (ϵ) and permeability (μ) of a material determines the response of the material to electromagnetic radiation. In many cases, the real part of ϵ and μ are both positive for materials that can be found in nature. Metamaterials (MTMs) are engineered media that are designed to have either a negative permittivity or a negative permeability or both. Negative permittivity and permeability cause electromagnetic waves travelling through this medium to exhibit unusual characteristics. The zero specular reflection layers using double negative (DNG) materials were examined in the first part of this thesis. The equations related to specular absorbers are analyzed based on the transmission line approach and numerical solutions are used in order to generate universal design charts for zero specular reflection absorbers. A MATLAB program is developed in order to generate the universal curves for double-positive (DPS) and DNG materials. Several methods to extract the effective permittivity and permeability of both normal materials and MTMs from measured or simulated scattering parameters were examined in the second part of this thesis. Microwave Studio (MWS) by Computer Simulation Technology (CST) was used to model the materials in a free space environment in order to calculate the S-parameters (S_1 and S_2) from which the constitutive parameters μ and ϵ can be extracted. The results were compared to published data.

KEYWORDS: Metamaterials, Negative Index, Universal Design Chart, Transcendental Equation, Complex Permittivity and Permeability, Constitutive Parameters, S-parameters

A COMPRESSION ALGORITHM FOR FIELD-PROGRAMMABLE GATE ARRAYS IN THE SPACE ENVIRONMENT

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The focus of this thesis is a lossy Fourier-transform-based compression algorithm for implementation on field-programmable gate arrays in the space environment. The algorithm computes the fast Fourier transform (FFT) of a real input signal, determines the energy in user-defined time and frequency ranges of interest, and transmits only those frequency domain portions of the signal that exceed the

predefined thresholds. Error detection against single event upsets for the FFT is implemented by comparing the sum of the squares of the input to the scaled sum of the squares of the FFT output, which should be equal according to Parseval's theorem. Error correction is implemented by duplicating the FFT calculation and error detection and choosing the output of the FFT that is not in error.

KEYWORDS: Fast Fourier Transform, Software Defined Radio, Field Programmable Gate Array, Compression, Lossy Data Compression, Fault Tolerant, Single Event Upset

EVALUATION OF WIDEBAND LEAKAGE CANCELLATION CIRCUIT FOR IMPROVED TRANSMIT-RECEIVE ISOLATION

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The objective of this thesis is to improve the cancellation performance of a wideband leakage cancellation circuit (WLCC). The results of this thesis can be applied to any sensor or communication system that simultaneously transmits and receives, for example, continuous wave (CW), frequency modulated continuous wave (FMCW) radar, or a wirelessly networked distributed digital phased array (WNDDPA), where the isolation and cancellation are required between the transmitted and received signals.

The approach is to investigate leakage cancellation circuit (LCC) techniques in the analog domain. A frequency demultiplexing and multiplexing circuit (FDMC) is adopted for the analog study and is simulated using Advanced Design System 2011.05 (ADS). Both narrowband and wideband LCC models are simulated in ADS to investigate their phase and amplitude balance properties. Methods such as applying grounded stubs to match the phase slopes of the cancellation and leakage paths are also investigated.

Two sets of grounded shunt stubs with different characteristics are applied on the leakage and cancellation paths to achieve near coherent cancellation. Using this configuration, the maximum cancellation of the LCC is about 87 dB, and the 3.0 dB bandwidth of the cancellation is about 56 MHz.

KEYWORDS: Transmit Receive Isolation, wideband, leakage cancellation

MASTER OF SCIENCE IN ENGINEERING SCIENCE

AERODYNAMIC ANALYSIS OF A CANARD MISSILE CONFIGURATION USING ANSYS-CFX

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This study used the Computational Fluid Dynamics code, ANSYS-CFX to predict the static aerodynamic characteristics of a canard-wing missile configuration with a hemispherical nose, triangular wedge canards and fixed trapezoidal wings. The study was conducted for Mach numbers of 0.2, 0.8 and 1.2. The results were compared against experimental data from actual wind tunnel tests and data from a semi-empirical method, AP09. The ANSYS-CFX results showed good agreement for CN, CM, and CL but less agreement for CA when compared to the experimental results. The AP09 results also showed good agreement for CN, CM, and CL but also showed less agreement for CA.

KEYWORDS: ANSYS, CFX, Canard, Computational Fluid Dynamics, Missile, AP09.

MASTER OF SCIENCE IN INFORMATION OPERATIONS

HOW TO STABILIZE FAILING STATES: THE GOOD, THE BAD AND THE UGLY OF INTERNATIONAL INTERVENTION

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The international community is often challenged with stabilizing failing states that are incapable of providing security, health, food and water to their citizens. Humanitarian concern about starvation, rapes, massacres, and oppression of the vulnerable in these states must be addressed. These states may also provide safe havens for terrorists and other groups that become threats to global security. The international community establishes complex missions with both a “soft approach” of providing only humanitarian aid and a stronger version that exercises binding power over local stakeholders.

This thesis analyzes these complex international interventions and argues that missions with binding power are more successful. It begins with theoretical reasoning on why missions with binding power are expected to be successful and continues with empirical data through the comparison of 13 international missions in eight different countries. Five of these international interventions in three countries are reviewed in detail. The UNMIK and EULEX in Kosovo and UNOSOM in Somalia are considered as successful examples while the UNOSOM II and AMISOM in Somalia are failures.

Finally, this thesis analyzes the current situation in Yemen and provides policy recommendations by applying lessons drawn from the analysis and comparison of the case studies in Kosovo and Somalia.

KEYWORDS: Failing States, Complex International Interventions, United Nations, Kosovo, Somalia, Yemen, Binding Power of International Interveners.

INFLUENCE STRATEGY: PRINCIPLES AND LEVELS OF ANALYSIS

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U.S. strategy in current conflicts (Iraq, Afghanistan, and against al-Qaeda) has focused predominantly on heavy U.S. military involvement (mostly kinetic operations), while using influence components, for the most part, in a reactive manner. There seems to be no grand influence strategy that informs U.S. policy and current

military operations. There are multiple descriptive formulations, but no prescriptive formulations on developing an effective influence strategy using influence principles. There is also a lack of systematic studies analyzing the impact and effectiveness of influence strategy in conflicts. This thesis explores strategy and influence theory to identify key components of an effective influence strategy and how one should modify these components to increase strategic effectiveness. Using five levels of network analysis we propose six hypotheses and test them using comparative studies of five major strategic conflicts of the past century: the Boer War, WWI, WWII, the Cold War, and U.S. versus trans-national jihadi terrorists. Analysis indicates that: 1) the quality of the competing narratives will prove of decisive importance and 2) any communication strategy will need to address inconsistencies to be effective. The ultimate goal is not to control and guide the message, but to let the message guide and control our actions.

KEYWORDS: Influence, Strategy, Social Movement Theory, Principles, Levels of Analysis, Narrative, Doctrine, Social, Organizational, Technology, Networks, Boer War, World War I, World War II, Cold War, Trans-National Terrorism, jihadi, Information Operations, Military Operations, Message and Deeds, Consistency, Legitimacy, Media

ACTIVE CYBER DEFENSE: ENHANCING NATIONAL CYBER DEFENSE

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With increased dependency on the Internet, cyber attacks are fast becoming an attractive option for state adversaries, in part because of the ease of hiding one's identity. In response, governments around the world are taking measures to improve their national cyber defenses. However, these defenses, which are generally passive in nature, have been insufficient to address the threat. This thesis explores the possibility of employing active cyber defenses to improve cyber defenses at the national level. Active cyber defense refers to the use of offensive actions, such as counter hacking, pre-emptive hacking, etc., to defend against cyber attacks. This thesis studies the typologies of active cyber defense and examines how this approach can enhance a state's cyber defense posture.

KEYWORDS: Active cyber defense, Passive cyber defense, Cyber attack, GhostNet, Stuxnet, Estonia, Computer malware

MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

INTEGRATION OF VIRTUAL MACHINE TECHNOLOGIES INTO HASTILY FORMED NETWORKS IN SUPPORT OF HUMANITARIAN RELIEF AND DISASTER-RECOVERY MISSIONS

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The exploration of the applicability of virtualization technologies, particularly the Virtual Desktop Infrastructure (VDI) as developed by VMware incorporated, and virtualized applications in support of humanitarian relief and disaster recovery efforts will be the focus of this research. The current Hastily Formed Network (HFN) (Denning, 2006) as developed at the Naval Postgraduate School (NPS), and deployed by NPS faculty and students to recent disaster areas in New Orleans, Louisiana, and Haiti has provided ad hoc networking for disaster relief workers, local emergency responders, and civilians. Capabilities provided have included radio communications, access to the Internet, and Internet Protocol (IP) telephones to name a few. However, no provision has been incorporated into the HFN system which provides for access to applications and data which may be of a mission critical nature. The ability to have a portable Emergency Operations Center (EOC) with virtual desktops, applications, and data, supported by the communications and power infrastructure deployed and described as a HFN should add significant capabilities to the original HFN design and value for the users of the system as they attempt to return to normal day to day operations.

KEYWORDS: Virtualization, Hastily Formed Networks, Virtual Desktop Infrastructure, Ad-Hoc, First Responders, Humanitarian Relief, VDI, VM, Thin Client, Zero Client

THE USE OF A COLLABORATIVE COMMON-PARTS CATALOG TO ACHIEVE INCREASED EFFICIENCY AND COST SAVINGS IN THE FLEET-MODERNIZATION PLAN

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Continual modernization and maintenance efforts are essential to ensure the U.S. Navy's ability to commit naval assets to deter adversaries abroad and contribute meaningfully to national security. Despite budgetary pressures to reduce defense expenditures, the need for deployable platforms remains constant. To address this tension between a reduction in resources matched with a constant demand signal, the U.S. Navy has invested considerable fiscal and human capital to develop effective and efficient processes by which to accomplish maintenance, modernization and repair for fleet assets.

Using a knowledge-value added (KVA) methodology, this thesis looks to identify and quantify additional cost savings that can be achieved in the U.S. Navy's ship maintenance and modernization program (SHIP-MAIN) through use of collaborative information technologies. Specifically, this study will look at the value

of applying the common-parts catalog (CPC), a collaborative tool in use at many major shipbuilders, to direct use in SHIPMAIN. An analysis of a To-Be model of the SHIPMAIN process with CPC with the current As-Is model of SHIPMAIN suggests savings in excess of \$20 million a year can be achieved over current processes.

KEYWORDS: Knowledge Value Added, KVA, Ship Maintenance and Modernization, Return on Investment, ROI, Return on Knowledge, ROK, Information Technology, Collaboration, Navy Shipyards, PLM, Product Lifecycle Management, SHIPMAIN, Common Parts Catalog, CPC, Naval Shipbuilding Research Program, NSRP

MASTER OF SCIENCE IN MANAGEMENT

THE IMPACT OF RECHARGEABLE BATTERIES: QUANTIFYING THE COST AND WEIGHT FOR A MARINE INFANTRY BATTALION

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Master of Science in Management—December 2011

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Second Reader: Keenan D. Yoho, Graduate School of Business and Public Policy

Since the implementation of distributed operations with a higher density of tactical field radios, optics and electrical tactical equipment, the demand for batteries has increased significantly. While advances in technology have increased the lethality of Department of Defense (DoD) forces, sustainment and increased resupply convoys have increased the risk of logistical support and costs. This thesis examines the viability, cost savings, and operational weight associated with the use of rechargeable batteries.

KEYWORDS: Rechargeable Batteries, Life Cycle Cost, Fully Burdened Costs, Fully Burdened Cost Of Fuel, Fully Burdened Cost Of Batteries, Battery, Disposal Cost, Cost Savings, Weight Savings, BA-5590, BB-2590, Battery Charger, Suitcase Portable Charger (SPC), Vehicle-Mounted Charger (VMC), Solar Portable Power System (SPACES)

ANALYSIS OF HISTORICAL MATERIEL-RETURN PROGRAM (MRP) CREDITS AT THE 1ST MARINE LOGISTICS GROUP REPARABLE ISSUE POINT (RIP)

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Master of Science in Management—December 2011

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Materiel-returns program (MRP) credits have increased 1st Marine Logistics Group's (1st MLG) total obligation authority by an average of 27% annually since 2008. However, 1st MLG has been unable to leverage the MRP in budget execution due to an inability to forecast future credits.

The purpose of this research is to determine whether analysis of historical MRP credits at 1st MLG could enable the comptroller to forecast future credits, which would enable 1st MLG to leverage MRP credits and budget more efficiently in a constrained fiscal environment. This research utilized descriptive analysis of historical credits to identify systemic patterns or trends associated with MRP. The analysis of MRP credits focused on two specific areas: (1) the accuracy of credit estimates provided by the sources of supply (SOSs), and (2) the amount of time it took for 1st MLG to receive the actual credit.

The primary finding of this research was that 1st MLG should be able to forecast MRP credits. The research showed that historically over a two-year period, SOSs accurately estimated credits 88.3% of the time and SOSs issued 95% of all actual credits within 90 days of 1st MLG submitting an item into MRP.

KEYWORDS: Materiel Returns Program, Reparable Issue Point, Secondary Reparable, SECREP, Credit, Source of Supply, MRP, RIP, Marine Logistics Group

**COMPARATIVE EFFECTIVENESS IN MEDICINE:
ANALYSIS OF EPISIOTOMY PRACTICE PATTERNS**

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Master of Science in Management—December 2011

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This thesis provides empirical evidence to demonstrate or disprove claims that findings from a major systematic review published in 2005 have led to further declines in practices of episiotomy. The study uses data from the Healthcare Cost and Utilization Project: State Inpatient Databases (HCUP SID) and American Hospital Association (AHA) annual surveys. The sample consists of 648,141 patients from 897 hospitals between 2003 and 2008. Both fixed and random effects models are specified to estimate the effects of the JAMA publication, hospital characteristics including interaction terms and patient compositions on episiotomy rates. In addition the study analyzes variation of practice patterns to examine whether the JAMA publication has the desirable impact on clinical practices.

The results show that the declining episiotomy trends accelerate marginally after the JAMA publication. Hospitals do not also appear to respond differentially to the JAMA publication for most hospital characteristics, except for hospital sizes, maternity ward turnover and ownership structure. The analysis of practice pattern variation suggests that practice variations by volumes are declining but variances of episiotomy rates remain substantial. More effective strategies should be formulated to reach out to different audiences to bridge the gap between research evidences and clinical practices on episiotomy.

KEYWORDS: Episiotomy, Spontaneous Delivery, Operative Delivery, Hartmann, Comparative Effectiveness Research

**MARINES VS. CONTRACTORS: AN ANALYSIS OF A SUPPLY OUTSOURCING
INITIATIVE AND ITS IMPACT ON COST AND EFFICIENCY**

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Master of Science in Management—December 2011

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Since 2001, the Marine Corps has outsourced the management of all individual issue combat gear. This contracted outsourcing, called the consolidated issue facility (CIF) and then the individual issue facility (IIF) under the direction of local Marine Expeditionary Force Headquarters (MEF HQ) and Marine Corps Logistics Command (LOGCOM), are responsible for the distribution, management, and collection of every Marine's individual combat issue of gear; a task previously accomplished by each unit's individual organic supply section. By removing this burden on the supply sections, the Marine Corps was theoretically able to free-up Marines to fill billets in warfighting roles. The Marine Corps has touted the ability to save money and create efficiencies that did not exist previously with organic Marine Corps-led supply operations.

The Marine Corps is looking to increase the amount of assets managed by an outside vendor, by outsourcing management of unit assets such as soft walled shelters and camouflage netting to a unit issue facility (UIF) using the same model as the CIF/IIF. This paper will explore if the CIF/IIF program saved the Marine

Corps money from 2001 thru 2010, allowed for transfer of personnel to other roles, and if the program is an effective model for future outsourcing endeavors.

KEYWORDS: A-76, Outsourcing, Privatization, CIF, Marine Corps, Supply

A COST-BENEFIT ANALYSIS OF RADIO-FREQUENCY IDENTIFICATION (RFID) IMPLEMENTATION AT THE DEFENSE MICROELECTRONICS ACTIVITY (DMEA)

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This thesis focuses on the Defense Microelectronics Activity (DMEA) and its need to reduce its budget through becoming more efficient. There are many means for becoming more efficient; this report will analyze the adoption of radio-frequency identification (RFID) technology as one way in which DMEA can achieve cost savings. The goal was to construct a working model to simulate factory conditions at electronics manufacturers' facilities, regardless of the size or breadth of production. The end state was to identify all major variables associated with the costs of RFID implementation, and the derived annual benefits, thereby giving decision makers an idea of the relative financial attractiveness of RFID

KEYWORDS: Radio Frequency Identification, RFID, Defense Microelectronics Activity, DMEA, Cost Benefit Analysis, Costs, Benefits, Savings

THE FUTURE OF UNMANNED AIRCRAFT SYSTEMS IN SUPPORT OF THE MARINE EXPEDITIONARY UNIT

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Master of Science in Management—December 2011

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The USMC Marine Expeditionary Unit (MEU) is commonly referred to as “the nation’s 911 force.” It must be capable of executing a full spectrum of missions from low-intensity humanitarian assistance and noncombat evacuations to high-intensity major combat operations. The structure and equipment are designed around this multimission requirement. However, the USMC owns the fixed-winged Shadow unmanned aircraft system (UAS) and is in the process of acquiring a small fixed-wing UAS, the small tactical UAS (STUAS) to provide intelligence, surveillance, and reconnaissance. The USMC is also researching a cargo resupply UAS based on helicopter technology. The USMC focus on single mission UAS does not fit with the MEU’s mission requirements. This thesis will examine MEU mission requirements and recommend a UAS capability set that best supports MEU operations. From this recommended set of requirements, the thesis will use a cost analysis to determine a future UAS program of record.

KEYWORDS: Unmanned Aircraft System, UAS, Marine Expeditionary Unit, MEU, mission, USMC, Marine Corps

MASTER OF SCIENCE IN MECHANICAL ENGINEERING

USING X-RAY DIFFRACTION TO ASSESS RESIDUAL STRESSES IN LASER PEENED AND WELDED ALUMINUM

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Master of Science in Mechanical Engineering-December 2011

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Second Reader: Sarath Menon, Department of Mechanical and Aerospace Engineering

This thesis examines the interplay of residual stress distributions caused by welding and laser peening of marine aluminum alloy 5083. Residual stresses at welds in this alloy can cause fatigue and stress corrosion cracking in ship superstructures. X-ray diffraction was used to measure the residual stress distributions across welded and laser peened areas of welded aluminum plate. Full strain and stress tensors were measured and calculated in order to develop a fuller picture of the residual stress distribution in this complex geometry. Electropolishing was used to take residual stresses from specified depth below the surface. The tensor analysis was found to be extremely sensitive to the exact choice of diffraction angles used in the experiment, and an algorithm was developed to optimize the design of the diffraction experiment. Bi-axial stress analysis did show an increase in compressive stress from the laser peening after a couple tenths of a millimeter followed by a gradual decrease in compressive stress as depth increases.

KEYWORDS: X-ray Diffraction, Residual Stresses, Laser Peening, AA5083

STUDY OF THE PROGRESSIVE FAILURE OF COMPOSITES UNDER AXIAL LOADING WITH VARYING STRAIN RATES

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Master of Science in Mechanical Engineering-December 2011

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Second Reader: Jarema M. Didoszak, Department of Mechanical and Aerospace Engineering

This study investigated the progressive damage/failure of composite panels with open circular holes under progressive axial loading. A series of experiments was carried out to determine the failure in laminated specimens with and without circular holes under tensile and compressive loads, respectively.

Different strain rate loading was applied to observe the rate effect on the damage initiation and propagation. Both uniform and non-uniform strain rate loads were applied to the composite specimens in order to understand the varying strain rate effect on the damage initiation and growth. With an increasing load, matrix cracking, surrounded by delamination occurred and lead to fiber breaking at the edge of the hole of high stress/strain concentration. When damage reached a critical state, the laminate failed catastrophically. By utilizing the optical microscope, the matrix cracking and fiber breaking leading to fracture was observed.

The fracture strength and strain of composites were varied depending on the applied strain rate loading. When the strain rate was changed halfway from the first rate to the second rate, the failure strength was relatively close to that at the constant second strain rate. However, fracture strain did not match with that

of the second strain rate. Finally, the experimental results from the open hole tension was compared against Whitney-Nuiser Failure Prediction Theory, namely the Point Stress Criterion and Average Stress Criterion.

KEYWORDS: Compression test, Tension test, Varying strain effect, Fracture strength, Composite

DEVELOPMENT OF A SPHERICAL COMBUSTION CHAMBER FOR MEASURING LAMINAR FLAME SPEEDS IN NAVY BULK FUELS AND BIOFUEL BLENDS

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Co-Advisor: Christopher M. Brophy, Department of Mechanical and Aerospace Engineering

This thesis presents the results of an experimental study to determine laminar flame speeds using the spherical flame method. An experimental combustion chamber, based on the constant-volume bomb method, was designed, built, and instrumented to conduct these experiments. Premixed Ethylene/air mixtures at a pressure of 2 atm, temperature of 298 ± 5 K and equivalence ratios ranging from 0.8 to 1.5 were ignited and using a high speed video Schlieren system images were taken to measure the laminar flame speed in the expanding spherical flame front. The results were compared against published data for ethylene/air mixtures which yielded agreement within 5%.

An attempt was made to measure the laminar flame speed for F-76 at a pressure of 5 atm and temperature of 500K; however, premixed conditions were unable to be met due to auto-ignition and vapor characteristics of F-76. Suggestions for future work provide a potential solution and improvement to the current design.

KEYWORDS: Laminar Flame Speed, Spherical Flame method, F-76, JP-5, Bio-Derived fuels

DEFENSE AGAINST SHIP AS A WEAPON

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Advisor: Thomas V. Huynh, Department of Systems Engineering

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As an example of ships used as weapons (SAW), an oil tanker is hijacked and commandeered by terrorists to collide with a high-value maritime or shore target. If sunk or destroyed in a shipping lane as a result of a counter measure, the SAW's collateral damage would severely disrupt the traffic flow in the shipping lane. To prevent such a disruptive catastrophe, non-destructive measures must be implemented to cause the SAW to deviate from its destructive path toward the target. One such a measure involves a strategic application of forces induced by water plume barriers (WPB) to SAW. The goal of this thesis is to examine the feasibility of realizing such a measure.

Toward this goal, a mission analysis, using the Singapore Strait as setting and petrochemical plants on Jurong Island as targets of a SAW attack, establishes the requirement on the deviation of the SAW path from its destructive course. The nominal WPB-induced force that satisfies the deviation requirement is estimated using ship hydrostatics. Solving the equations of motion governing the response of the SAW to a strategic application of a WPB-induced force yields the SAW's motion, which is used to define a range of the WPB-induced forces and their application locations and durations that satisfy the SAW's path deviation requirement.

Parametric studies were conducted for a range of physically realizable WPB-induced forces and application times. The results demonstrate that, in principle, the objectives of this work are achievable. These results will

be validated upon the completion of an on-going research by National University of Singapore (NUS). The range of the WPB-generated forces and the application durations serve as requirements to the generation of WPBs.

KEYWORDS: Ship As a Weapons, Water Plume Barriers

BALLISTIC MISSILE INTERCEPTION FROM UCAV

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Master of Science in Mechanical Engineering–December 2011

Thesis Advisor: Oleg Yakimenko, Mechanical and Aerospace Engineering

Second Reader: Christopher Brophy, Mechanical and Aerospace Engineering

The objective of this thesis is to conduct a study to evaluate the feasibility of the hit-to-kill trajectory-shaping(TS) guidance of an air-launched missile from a UCAV against enemy ballistic missiles via computer simulation, using a TS-guidance algorithm developed by LT Lukacs and Prof Yakimenko based on the direct method of calculus of variations that maximizes the kinetic energy transfer of an air-launched missile against an aerial target. The computer simulation code will generate the air-launched missile's entire flight path in order to minimize the distance travelled by the air-launched missile, minimize the time to intercept, and maximize kinetic energy transfer to the target (a simulated enemy missile) by controlling the interception geometry while providing near-optimal flight path to interception. This will be done by utilizing the direct method of calculus of variations combined with inverse dynamics theory to generate, in real time, an optimal flight path using the missile's onboard sensors and computers. The results have confirmed the feasibility of hit-to-kill trajectory-shaping(TS) guidance of an air-launched anti-ballistic missile from a UCAV.

KEYWORDS: Ballistic Missile Interception, UCAV, Trajectory-Shaping, Guidance Algorithm, Direct Method of Calculus

A FRAMEWORK FOR COLLABORATIVE QUADROTOR-GROUND-ROBOT MISSIONS

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B.S., Greek Naval Academy, July 2002

Master of Science in Applied Physics–December 2011

Master of Science in Mechanical Engineering–December 2011

Advisor: Oleg Yakimenko, Department of Mechanical and Aerospace Engineering

Co-Advisor: Richard Harkins, Department of Physics

The thesis proposes a real-time control algorithm for the cooperation of a joint team consisting of a quadrotor and a ground robot for coordinated ISR missions. The intended application focuses on indoor environments, where global-positioning system signals are unreliable or simply unavailable so that the control algorithms must rely on local sensor information. The thesis describes the appropriate set up of the lab and includes simulations using a full dynamic model of the quadrotor and robot, demonstrating the suitability of the implemented and the proposed control scheme into a waypoint navigation scenario.

The implemented controller uses the linear quadratic regulator method imposed into five different channels; pitch, roll, yaw, x-y position and height, configured to the appropriate gains for smoother following of the trajectory. The proposed control scheme incorporates three key aspects of autonomy; trajectory planning, trajectory following and collaboration of the two vehicles. Using the differentially-flat dynamics property of the system, the trajectory optimization is posed as a nonlinear constrained optimization within the output space in the virtual domain, not explicitly related to the time domain. A suitable parameterization using a virtual argument as opposed to time is applied, which ensures initial and terminal constraint satisfaction. The speed profile is optimized independently, followed by the mapping to the time domain achieved using a speed factor.

KEYWORDS: Quadrotor, Ground Robot, Cooperation, Localization System, Quanser, Optitrack cameras, linearization, LQR, Waypoint Navigation, Direct method, Trajectory Generator, Trajectory Following, Optimization, Inverse Dynamics.

A STUDY INTO ADVANCED GUIDANCE LAWS USING COMPUTATIONAL METHODS

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Master of Science in Mechanical Engineering—December 2011

Advisor: Robert G. Hutchins, Department of Electrical and Computer Engineering

Co-Advisor: Oleg Yakimenko, Department of Mechanical and Aerospace Engineering

Effective guidance laws that are optimal for tactical air-to-air scenarios tend to improve the performance characteristics of the missile and increase the probability of a hit in combat. Proportional guidance is the current baseline algorithm for tactical missile guidance. Increases in computational capabilities now permit more complicated guidance laws to be implemented. This research focuses on two promising advanced guidance laws, comparing them to proportional navigation using simulation, with the kinematic boundary as the performance measure. Studies are also made of performance degradation in the presence of sensor noise.

The three guidance laws, Proportional Navigation (PN), Augmented Proportional Navigation (APN) and Differential Geometry (DG), were each simulated against a non-maneuvering target and a maneuvering target. The theoretical missile engagement envelope (the kinematic boundary) is utilized as a simple and intuitive visual aid in comparing the effectiveness of each guidance law.

Band-limited white noise is then introduced into the seeker system to determine the ability of the guidance law to deal with noise perturbations, in particular, to discover the level of noise tolerance for each guidance law.

This research used a simulation model previously developed here at the Naval Postgraduate School (NPS). This simplified six degree of freedom (6DOF) model was used in a slightly modified form to: 1) verify earlier results obtained at NPS, 2) investigate an additional guidance law, the DG law, and 3) study the effects of noise on the robustness of the various guidance laws.

KEYWORDS: Missile Guidance Laws, Proportional Navigation, Augmented Proportional Navigation, Differential Geometry Guidance, Kinematic Boundary Analysis.

SYNTHESIS AND CHARACTERIZATION OF ALUMINUM-NANODIAMOND COMPOSITE POWDERS BY HIGH-ENERGY BALL MILLING

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Co-Advisor: Luke Brewer, Department of Mechanical and Aerospace Engineering

High-energy ball milling was studied for the ex situ strengthening of Aluminum with nanodiamond (ND). Al-ND metal matrix composite powders with 5 wt% and 10 wt% nanodiamond were synthesized by high-energy ball milling of the blended component powders. Stearic acid was used as a process control agent to minimize agglomeration of the powders upon milling. A uniform distribution of the ND reinforcement was successfully obtained after milling the powders for a period of ten hours with a ball-to-powder ratio of 30:1 in a SPEX 8000M ball mill. Composition and properties of the Al-ND composite was studied using energy dispersive spectrometry (EDS) mapping, scanning electron microscopy (SEM), X-ray diffraction (XRD), optical microscopy, and nanoindentation techniques.

KEYWORDS: aluminum, ball milling, nanocarbon, nanocomposite, nanodiamond, nanoindentation

AERODYNAMIC VALIDATION OF EMERGING PROJECTILE CONFIGURATIONS

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Master of Science in Engineering Science, Mechanical Engineering—December 2011

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**Co-Advisor: Anthony J. Gannon, Department of Mechanical
Engineering and Aerospace Engineering**

Ever-increasing demands for accuracy and range in modern warfare have expedited the optimization of projectile design. The crux of projectile design lies in the understanding of its aerodynamic properties early in the design phase. This research first investigated the aerodynamic properties of a standard M549, 155mm projectile. The transonic speed region was the focus of the research as significant aerodynamic variation occurs within this particular region. Aerodynamic data from wind tunnel and range testing was benchmarked against modern aerodynamic prediction programs like ANSYS CFX and Aero-Prediction 09 (AP09). Next, a comparison was made between two types of angle of attack generation methods in ANSYS CFX. The research then focused on controlled tilting of the projectile's nose to investigate the resulting aerodynamic effects. ANSYS CFX was found to provide better agreement with the experimental data than AP09.

KEYWORDS: Aerodynamic Coefficients, Normal Force Coefficient, Pitching Moment Coefficient, Total Drag Coefficient, Transonic, Angle of Attack, Re-design, ANSYS CFX, AP09

**EXPERIMENTAL STUDY OF FLUID STRUCTURE INTERACTION EFFECTS
ON METAL PLATES UNDER FULLY DEVELOPED LAMINAR FLOW**

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Master of Science in Mechanical Engineering—December 2011

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Co-Advisor: Jarema M. Didoszak, Department of Mechanical and Aerospace Engineering

The development of a reference test case with repeatable and accurate results is of paramount importance for the validation of numerical Fluid Structure Interaction (FSI) models and simulations. In this study, a new experimental facility was designed and constructed for the investigation of FSI between fully developed laminar flow and test section plate in an enclosed flow channel. Computational Fluid Dynamics (CFD) software was used to model laminar flow in a shallow rectangular duct to determine proper dimensions of the experimental apparatus. The FSI problem was then modeled in CFD using the predetermined dimensions. The experimental set up included construction of the duct, creation of a closed flow circuit and its instrumentation. The metal test plate was fitted with gages to gather real-time information on the strain levels during the experiment. Subsequently, the experiment was performed and the results were compared with the FSI modeling.

KEYWORDS: Fluid Structure Interaction, Flow Channel Experiment, FSI CFD Modeling

AERODYNAMIC ANALYSIS OF THE M33 PROJECTILE USING THE CFX CODE

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The M33 projectile has been analyzed using the ANSYS CFX code that is based on the numerical solution of the full Navier-Stokes equations. Simulation data were obtained against various Mach numbers ranging from $M = 0.5$ to $M = 2.6$ at 0° and 2° angles of attack. Simulation data were also obtained against various angles of attack from 0° to 85° for $M = 0.5$.

For Mach numbers between $M = 0.5$ to 2.6 , the results obtained using the combined k-epsilon and Shear Stress Transport model show good agreement with the experimental range data for the normal force and pitching moment coefficient. The drag coefficient at zero angle of attack tended to be over-predicted by an average error of 11.6% with the highest error occurring at $M = 1.5$.

For varying angle of attack up to 85° at $M = 0.5$, the results obtained from CFX code were compared with simulation results obtained from AP09. The data showed good agreement only up to 20° angle of attack.

KEYWORDS: Aerodynamic, Projectiles, CFX, Normal Force Coefficient, Pitching Moment Coefficient, Drag Coefficient.

DYNAMIC RESPONSE OF SOLDERED ELECTRONIC COMPONENTS UNDER IMPACT LOADING

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Master of Science in Mechanical Engineering—December 2011

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Co-Advisor: Jarema Didoszak, Department of Mechanical and Aerospace Engineering

The objective of this research was to analyze the effects of impact loading on electronic component failure. A standard fiberglass composite printed circuit board (PCB) card was used in two impact tests. The first test consisted of a PCB card with four adhered strain gauges, which were mounted inside an aluminum box fabricated for testing. Impact testing was conducted with weights ranging from 0 to 30 lbs, and the corresponding strain values were recorded. For the second set of impact tests, a new circuit card was mounted inside the aluminum box. The new circuit card maintained the same dimensions, but no strain gauges were attached. Solder joints were placed at nine different locations on the card, and testing was conducted to determine the impact load at solder joint failure. Both visual and resistance inspections were conducted after each impact. After seven drop tests were conducted, no failure had been detected. This lack of failure was attributed to the rigidity and substantial nature of the aluminum box used in testing.

Upon completion of both impact tests, two Finite Element Method (FEM) models were built. The first FEM model represented a scaled version of the PCB card, four solder joints, and a silicon computer chip. Strain data from the PCB card testing was input into the model, and a corresponding solder joint strain was calculated. The second FEM model was a full-scale version of the aluminum box and mounted circuit card. A force was applied to the box, and the various strains were recorded on the PCB card. The collection of this data has helped to establish a valuable relationship between the strains in PCB cards and solder joints, and it will increase the understanding of electronic component failure under impact loading conditions.

NUMERICAL ANALYSIS OF SHEAR THICKENING FLUIDS FOR BLAST MITIGATION APPLICATIONS

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Master of Science in Mechanical Engineering—December 2011

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Co-Advisor: Jarema Didoszak, Department of Mechanical and Aerospace Engineering

Improvised Explosive Devices (IEDs) have evolved over the years to become one of the main causes of ca-

sualties and fatalities in recent conflicts. Besides developing robust tactical strategies to ensure that friendly forces are less susceptible to this persistent threat, counter-IED technologies were also studied to reduce the vulnerability of both personnel and equipment. One area of research focuses on the improvement of blast attenuation using Shear Thickening Fluid (STF).

The STF is a dilatant material which displays non-Newtonian characteristics in its unique ability to transit from a low viscosity fluid to a high viscosity fluid. Although empirical research and computational models using the non-Newtonian flow characteristics of STF have been conducted to study the effects of STF on blast mitigation, to the author's best knowledge, no specific research has been performed to investigate the STF behavior by modeling and simulation of the interaction between the base flow and embedded rigid particles when subjected to shear stress.

The model considered the Lagrangian description of the rigid particles and the Eulerian description of fluid flow. The numerical analysis investigated key parameters such as applied flow acceleration, particle distribution arrangement, volume concentration of particles, particle size, particle shape, and particle behavior in Newtonian and Non-Newtonian fluid base. The fluid-particle interaction model showed that the arrangement, size, shape and volume concentration of particles had a significant effect on the behavior of STF. Although non-conclusive, the addition of particles in Non-Newtonian fluids showed a promising trend of better shear thickening effect at high shear strain rates.

KEYWORDS: Shear Thickening Fluid, Blast Mitigation, Flow-Particle Interaction

MASTER OF SCIENCE IN OPERATIONS RESEARCH

ENSURING RESILIENCY OF THE MILK AND DAIRY INDUSTRY IN CALIFORNIA

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Master of Science in Operations Research—December 2011

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Second Reader: David L. Alderson, Department of Operations Research

We model the milk and dairy industry in California focusing on the production, processing, and distribution of bulk milk at the county level. We analyze the sensitivity of this industry when faced with worst-case disruptions, where a “worst-case” disruption corresponds to the greatest shortage of milk supply throughout California. The major highways in California are used to connect all of the counties and illustrate where the bulk milk is moving. We utilize Attacker-Defender (AD) modeling techniques to determine where worst-case disruptions occur. This reveals vulnerabilities within the milk and dairy industry. We examine three specific scenarios: (1) a quarantine of each county due to a foot and mouth disease (FMD) outbreak or any other event that would cause the complete stoppage of production, processing and movement of milk in a county over a seven day period, (2) 1 to 15 attacks on the milk and dairy industry in a 45 day time period, and (3) the isolation of Northern and Southern California over a seven day time period that could be caused by a natural disaster.

KEYWORDS: Milk and Dairy Industry, Vulnerability, Attacker-Defender, California

ISLAMISM AND RADICALISM IN THE MALDIVES

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Second Reader: Anshu Chatterjee, DoD Contractor

This thesis aims to explore the rise of Islamism and Islamic radicalism in the Republic of Maldives. It analyzes the causes and grievances which have fueled the rise of political Islam, as well as its radical elements, and the main groups operating in both the political and social space (as well as on the fringes), including an analysis of their main ideological drivers and their social and political outlook.

The closed and conspiratorial nature of the Maldivian political environment, as well as the use of repression to quell political dissent and the manipulation of Islamic religious ideals to cement political position was one factor that led to the rise of Islamism and Islamic radicalism. Another was the rapid modernization that introduced alien concepts and values into Maldivian society. These militated against the traditional norms and cultures and wrought havoc on the social structures, causing intense alienation and social dislocation. All these changes were taking place in a context where Maldives was being infiltrated by radical elements, both local and foreign. They made ample use of the social conditions to craft a narrative that was conducive to their recruitment and radicalization efforts.

KEYWORDS: Maldives, Islamism, Political Repression, Modernization, Marginalization, Terrorism

A MODEL FOR THE GROWTH OF NETWORK SERVICE PROVIDERS

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Master of Science in Operations Research—December 2011

Advisor: David L. Alderson, Department of Operations Research

Second Reader: Nedialko B. Dimitrov, Department of Operations Research

Consider a set of points and an associated demand for traffic between each pair of points. In this thesis, we consider the perspective of a notional network service provider (NSP) who has to decide on the connections to build and the demands to satisfy in order to maximize its profits. The NSP makes these decisions based on the demand for connectivity and the constraints on their resources needed to provide the connections. We perform numerical experiments to study the tensions faced by the NSP in its decisions to structure its service network. Through the results generated, we infer how demand, revenue and cost influence the decisions of the NSP.

KEYWORDS: Network Design, Network Modeling, Network Formation

ANALYSIS OF PROMOTION RATES TO LIEUTENANT COLONEL AND SELECTION FOR COMMAND FOR USMC AVIATION SUPPLY AND MAINTENANCE OFFICERS

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Master of Science in Operations Research—December 2011

Advisor: Major Chad W. Seagren, USMC, Department of Operations Research

Second Reader: Ronald D. Fricker Jr., Department of Operations Research

The purpose of this thesis is to identify those statistically significant variables associated with promotion to lieutenant colonel and selection for command of a Marine Aviation Logistics Squadron (MALS) or Center for Naval Aviation Technical Training Marine Unit for Aviation Maintenance Officers (AMOs) and Aviation Supply Officers (AVNSUPOs).

A data set is constructed for the 102 in-zone AMOs and AVNSUPOs competing for promotion, consisting of demographic and Fitness Report (FITREP) data for each officer covering Fiscal Years 2004-2012.

Utilizing logistic regression, the findings conclude that serving as a MALS Executive Officer (XO), receiving a Meritorious Service Medal, and scoring above the Reviewing Officers' (RO) average scores improve one's probability for selection. Serving in combat is not a significant factor for promotion.

Because information on command selection is not available from Marine Corps Officer Assignments Plans and Programs Section, it is not possible to model for command selection. Instead, the following descriptive statistics provide insight on the type of officer selected to command. Forty percent served as Operations Officers. Forty-three percent served as XOs. Fifty-one percent of the officers scored above their ROs' average markings. Only 37% have completed at least one combat FITREP as a major.

KEYWORDS: USMC, officer, promotions, lieutenant colonel, MOS 6602, MOS 6002, AVNSUPO, AMO, Command Screening Program, logistic regression

FULLY BURDENED COST OF FUEL USING INPUT-OUTPUT ANALYSIS

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Master of Science in Operations Research—December 2011

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Second Reader: Daniel A. Nussbaum, Department of Operations Research

The Duncan Hunter National Defense Authorization Act for Fiscal Year 2009 mandates that the Fully Burdened Cost of Fuel, including the total cost of procuring and transporting fuel, infrastructure operating costs, and the cost of force protection for the logistics tail, be applied in trade-off analyses for all Department of Defense systems that create a demand for energy.

Using data from the Defense Logistics Agency Energy, this thesis builds a model of its worldwide supply chain for bulk fuels, and uses the principles of input-output analysis to calculate the total cost to deliver three fuel types to each destination in the supply chain. Although the Defense Logistics Agency Energy charges a standard price to each service for bulk fuels, these results show that they incur very different costs, ranging from less than a penny per gallon to over 70 cents per gallon, to deliver to different locations. Given the appropriate data on services' fuel distribution networks, a Department of Defense-wide extension of the Bulk Fuels Distribution Model could be used to replace the current seven-step Fully Burdened Cost of Fuel process with a single step, allowing for less complex and more accurate Fully Burdened Cost of Fuel calculations.

KEYWORDS: Analyses of Alternatives, Defense Logistics Agency Energy, Fully Burdened Cost of Fuel, Input-Output

SENSITIVITY ANALYSIS OF A COGNITIVE ARCHITECTURE FOR THE CULTURAL GEOGRAPHY MODEL

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Master of Science in Operations Research—December 2011

Advisor: Jeffrey A. Appleget, Department of Operations Research

Co-Advisor: Christian J. Darken, Department of Computer Science

Second Reader: MAJ Richard F. Brown, USA, TRADOC Analysis Center—Monterey

The success of Irregular Warfare (IW) and Counterinsurgency Operations depends on the ability to influence the civilian population based on an understanding of their social and cultural backgrounds. The Cultural Geography (CG) model was developed by TRADOC Analysis Center—Monterey, to provide military commanders with a means to evaluate the impact of IW tactical operations on the civilian population. A prototype Cognitive Architecture module was added to improve the representation of human cognition for determining the population's behavioral responses.

This thesis conducted a thorough sensitivity analysis on the Cognitive Architecture module in the CG model, using experimental design and statistical data analysis techniques, to obtain an assessment of its impact on the civilian population responses, in terms of their stances on key IW issues of concern. Significant single and pairwise interaction factors in the Cognitive Architecture that contribute to the civilians' issue stances were identified. The analysis revealed demographic stereotypes of population groups notably affected by the Cognitive Architecture. The results will help to streamline data collection efforts, and provide a useful methodology and dataset, to support verification and validation of the Cognitive Architecture. Future research will adapt the Cognitive Architecture across different scenarios, as it evolves with more features.

KEYWORDS: Cultural Geography, Stability Operations, Irregular Warfare, Agent-Based Modeling, Discrete Event Simulation, Planned Behavior, Cognitive Architecture, Design of Experiments, Nearly Orthogonal Latin Hypercube, Simulation Analysis

INFORMATION SELECTION IN INTELLIGENCE PROCESSING

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B.S., The Hebrew University, Jerusalem, June 2005

Master of Science in Operations Research—December 2011

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Nedialko B. Dimitrov, Department of Operations Research

Second Reader: Michael Atkinson, Department of Operations Research

In many intelligence agencies, the processing of data into usable information ready for analysis poses a significant bottleneck. Typically, much more data is available than what can be processed in the limited time available for processing.

We formulate the problem faced by an intelligence collection unit, when processing incoming raw information for delivery to intelligence analysts, as an exploration-exploitation problem: the processor has to choose between exploring for new sources of relevant information and exploiting known sources.

To address the exploration-exploitation problem, we develop a mathematical model of the processor's knowledge and examine algorithms that allow the processor to maximize the discovery of relevant data given a time limit. We derive insights on the performance of different algorithms using a simulated case study.

KEYWORDS: Exploration Exploitation problems, Intelligence Cycle, Intelligence Processing

HUB AND SPOKE LOGISTICS FOR MARITIME PATROL AND RECONNAISSANCE OPERATIONS

Robert Love Robinson—Lieutenant, United States Navy

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M.A.T., Norfolk State University, May 1999

Master of Science in Operations Research—December 2011

Advisor: Javier Salmeron, Department of Operations Research

Co-Advisor: Gerald Brown, Department of Operations Research

Second Reader: Jeff Kline, Department of Operations Research

This research studies the ability of eleven combat logistics force (CLF) ships and four transport aircraft to support building and sustaining operations at four maritime patrol and reconnaissance military airbases throughout the African continent. We have implemented a traditional hub and spoke (H&S) concept with sample demand data provided by the staff of Commander, Patrol and Reconnaissance Force Seventh Fleet, in a hypothetical situation where U.S. forces are required to assist the Nigerian government. We use the CLF Planner optimization tool to obtain shuttle schedules for three scenarios of daily demands of four commodities. One scenario requires the build-up of an airbase within seven days, and the other two require so in three days. All CLF shuttles have been randomly selected, positioned and loaded with commodities. Depending on the length of the build-up phase and the initial stock of commodities at the H&S, we find that the continuous sustainment operations (over a 45-day planning horizon) may not be feasible in some cases. Specifically, if a short build-up phase is required, we recommend the prepositioning of commodities at a minimum of 25% of daily demands, and dedicated air shuttles carrying only ordnance.

KEYWORDS: Combat Logistics Force; Optimization; Hub and Spoke; Maritime Reception Center

IMPROVING HEALTHCARE FACILITY LOCATIONS IN BAMYAN, AFGHANISTAN

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B.Eng., University of Queensland, Australia 2006

Master of Science in Operations Research—December 2011

Thesis Advisor: Ned Dimitrov, Department of Operations Research

Second Reader: Javier Salmeron, Department of Operations Research

The facility location problem is one of the oldest and most researched operations research problems. In this thesis, we utilize facility location models to determine the optimal locations and types of medical facilities to address the healthcare needs of the people in Bamyan Province, Afghanistan. The staffing levels and materials of a local medical facility in Afghanistan are designed to cope with the healthcare needs of the people. In this thesis, the medical facilities are defined to be part of a network system. These facilities can be strategically located in order to provide essential healthcare services to the population. We investigate the location, operating cost, and accessibility of the existing and future healthcare facilities. We also look into the ethnicity problem that would affect the selection of operators for the medical facilities. Our model would lead to an increased understanding of the impact of healthcare facility locations and the selection of operators, thus developing a cost-effective system that would involve the shifting or upgrading of existing healthcare facilities.

KEYWORDS: Healthcare, facility locations, location model, Bamyan

**STOCHASTIC NETWORK INTERDICTION FOR DEFENSIVE
COUNTER AIR-OPERATIONS PLANNING**

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Master of Science in Operations Research—December 2011

Advisor: Javier Salmeron, Department of Operations Research

Second Reader: Johannes O. Royset, Department of Operations Research

This thesis describes a stochastic, network interdiction optimization model to guide defensive, counter-air (DCA) operations planning. We model a layered, integrated air-defense system, which consists of fighter and missile engagement zones. We extend an existing two-stage, stochastic, generalized-network interdiction model by Pan, Charlton and Morton, and adapt it to DCA operations planning. The extension allows us to handle multiple-type interdiction assets, and constrain the attacker's flight path by the maximum allowable traveled distance. The defender selects the locations to install multiple interceptor types, with uncertainty in the attacker's origin and destination, in order to minimize the probability of evasion, or the expected target value collected by the evader. Then, the attacker reveals an origin-destination pair (independent of the defender's decision), and sends a strike package along a path (through the interdicted network) that maximizes his probability of evasion. By adding a small persistence penalty we ensure the plans are consistent in presence of minor variations in the number of interceptors. We present computational results for several instances of a test case consisting of the airspace over a 360-by-360 nautical miles area. The computational time ranges from some seconds to ten minutes, which is acceptable for operational use of this model.

KEYWORDS: Stochastic Optimization, Defender-Attacker Sequential Model, Mixed Integer Programming, Defensive Counter Air Operations, Integrated Air Defense System, Decision Aid

MASTER OF SCIENCE IN PHYSICS

CREATION AND OPTIMIZATION OF NOVEL SOLAR CELL POWER VIA BIMATERIAL PIEZOELECTRIC MEMS DEVICE

David C. Baughman—Lieutenant Commander, United States Navy

B.S., United States Naval Academy, June 2000

M.A., Naval War College, June 2007

Master of Science in Physics—December 2011

Master of Science in Space Systems Operations—December 2011

Advisor: Dragoslav Grbovic, Department of Physics

**Second Reader: Sebastian Osswald, Department of Mechanical and
Aerospace Engineering and Department of Physics**

Third Reader: Daniel Bursch, Aerospace Corporation

Current solar cell technology suffers low efficiencies in the commercial sector and cost prohibitive technology at higher efficiencies. This thesis investigates the possibility of a novel, alternate, avenue for the creation of solar power, which has the potential to be both cost effective and highly efficient. The approach converts solar energy into electrical energy via a MEMS device that utilizes spectrum-insensitive thermal absorption combined with power generation via the piezoelectric effect. The thesis investigates the underlying physics, materials needed, design requirements, computer modeling, optimization, and microfabrication process in the creation of such a device.

KEYWORDS: Thermal Bimetallic Effect, Piezoelectric Effect, Solar Cell, COMSOL Multiphysics

VIBRATIONAL ANALYSIS OF A SHIPBOARD FREE ELECTRON LASER BEAM PATH

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Master of Science in Physics—December 2011

Advisor: William B. Colson, Department of Physics

Second Reader: Keith Cohn, Department of Physics

This thesis explores the deployment of a free electron laser (FEL) weapon system in a shipboard vibration environment. A concept solid model of a shipboard FEL is developed and used as a basis for a finite element model which is subjected to vibration simulation in MATLAB. Vibration input is obtained from ship shock trials data and wave excited motion data from ship motion simulation software. Emphasis is placed on the motion of electron beam path components of the FEL and the feasibility of operation aboard ship. The resulting component motion after passive isolation control is within the amplitudes and frequencies that will allow at sea FEL operation with active electron beam steering.

KEYWORDS: Free Electron Laser, FEL, Passive Vibration Control, Ship Motion Simulation, Finite Element Modeling, Directed Energy

**SHIELDING REQUIREMENTS FOR AN ENERGY-RECOVERY LINAC
FREE ELECTRON LASER**

Robert E. Peterson—Lieutenant, United States Navy

B.S./M.S., New School University, June 2001

B.S., North Carolina State University, December 2003

Master of Science in Physics—December 2011

Advisor: William B. Colson, Department of Physics

Co-Advisor: Keith Cohn, Department of Physics

Many Free Electron Lasers (FELs) utilize high current, high energy electron beams. Inevitably, a small fraction of the electrons in the beam will exist outside the core beam; these electrons are referred to as beam halo. The halo electrons will travel down an FEL's transport system with the core electrons; any portion of those halo electrons that intercept transport system components can generate radiation that is harmful to the operating personnel. The amount of shielding that is required to keep personnel safe from radiation exposure is evaluated as a function of the lost halo current. Using the modeling software FLUKA, an analysis is presented describing the amount of necessary shielding for a given shielding material.

KEYWORDS: Free Electron Laser, Radiation Shielding, Halo

MASTER OF SCIENCE IN PROGRAM MANAGEMENT

ANALYSIS OF LEAN SIX SIGMA IN THE ARMY CONTRACTING PROCESS

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Eva Zucchetti, DoD Civilian

Master of Program Management –December 2011

Lead Advisor: Janie Maddox, Graduate School of Business and Public Policy

Support Advisor: Lisa L. Massi Lindsey, Graduate School of Business and Public Policy

In this Joint Applied Project we investigate Lean Six Sigma (LSS) as it pertains to contracting processes. This project will analyze whether or not LSS is an efficient and effective process to achieve the Army's goal of successful Business Transformation. The project will discuss the vision of the Department of Defense (DoD) and the Army for Business Transformation and what is being done to achieve their goals. Research will focus on whether LSS is working and what, if anything can be done to supplement progress.

The DoD is one of the largest and most complex organizations in the world. Transforming the Department's business operations and aligning its strategy, controls, people, processes and technology to truly effect this transformation is an enormous challenge.

KEYWORDS: Lean Six Sigma, Contracting, DMAIC, Power Steering, Business Transformation, TQM, Cycle Time

MASTER OF SCIENCE IN SPACE SYSTEMS OPERATIONS

CREATION AND OPTIMIZATION OF NOVEL SOLAR CELL POWER VIA BIMATERIAL PIEZOELECTRIC MEMS DEVICE

David C. Baughman—Lieutenant Commander, United States Navy

B.S., United States Naval Academy, June 2000

M.A., Naval War College, June 2007

Master of Science in Physics—December 2011

Master of Science in Space Systems Operations—December 2011

Advisor: Dragoslav Grbovic, Department of Physics

Second Reader: Sebastian Osswald, Department of Mechanical and

Aerospace Engineering and Department of Physics

Third Reader: Daniel Bursch, Aerospace Corporation

Current solar cell technology suffers low efficiencies in the commercial sector and cost prohibitive technology at higher efficiencies. This thesis investigates the possibility of a novel, alternate, avenue for the creation of solar power, which has the potential to be both cost effective and highly efficient. The approach converts solar energy into electrical energy via a MEMS device that utilizes spectrum-insensitive thermal absorption combined with power generation via the piezoelectric effect. The thesis investigates the underlying physics, materials needed, design requirements, computer modeling, optimization, and microfabrication process in the creation of such a device.

KEYWORDS: Thermal Bimetallic Effect, Piezoelectric Effect, Solar Cell, COMSOL Multiphysics

NEAR-STALL MODAL DISTURBANCES WITHIN A TRANSONIC COMPRESSOR ROTOR

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Master of Science in Space Systems Operations—December 2011

Advisor: Anthony J. Gannon, Department of Mechanical and Aerospace Engineering

Co-Advisor: Garth V. Hobson, Department of Mechanical and Aerospace Engineering

This research effort seeks to better understand non-periodic flow characteristics for a forward swept axial transonic compressor rotor when operating near stall. Improved performance of a military gas turbine engine may be achieved by better understanding the mechanisms responsible for near-stall non-periodic disturbances within a transonic compressor rotor.

Using pressure transducers, embedded within the rotor wall casing, data were acquired and calibrated at various speeds up to 90% of maximum rotation velocity. Within the 90% design speed, various data sets were acquired for different throttle configurations. A new method to post-process the data to allow better investigating of the non-periodic flow characteristics was developed. Using Fast Fourier Transforms, two distinct and dominant frequencies were identified and analyzed. Contour pressure distribution maps for varying throttle configurations; and the amplitude differences for each frequency of interest was generated to illustrate

correlations in frequency strength and its relationship with tip-leakage vortices, normal/oblique shocks, and passage-to-passage interactions.

This study uses effective instrumentation and robust data reduction techniques to successfully identify passage-to-passage distribution of non-periodic and periodic low dominant frequencies within the rotor blade passage prior to stall.

KEYWORDS: Transonic, Compressor, Pressure Instability, Low Dominant Frequencies, Turbomachinery, Near-Stall Disturbances.

SPACE SITUATIONAL AWARENESS CUBESAT CONCEPT OF OPERATIONS

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Master of Science in Space Systems Operations—December 2011

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Co-Advisor: James H. Newman, Space Systems Academic Group

Second Reader: James A. Horning, Space Systems Academic Group

The concept of space situational awareness (SSA) is important to preserve manned and unmanned space operations. Traditionally, ground based radar, electro-optical sensors and very limited space-based assets have been used as part of the space surveillance network (SSN) to track orbital debris, inactive and active satellites alike. With the current SSN assets aging and the need for SSA growing, it is important to explore new ways to ensure proper SSA is maintained to preserve space operations. The Space-based Telescope for the Actionable Refinement of Ephemeris (STARE) project was initiated to explore the potential for a cube satellite (CubeSat) to contribute to the current SSN, with an optical payload integrated into a 3U Colony II Bus. The bus and payload data from the CubeSat will be collected by the Naval Postgraduate School Mobile CubeSat Command and Control ground station. Telemetry data from the bus will be analyzed at NPS and the payload data at Lawrence Livermore National Laboratory. This thesis outlines the concept of operation for the STARE CubeSat and investigates the possibility of using the data generated by STARE to augment the SSN to reduce the errors associated with conjunction analysis performed at the Joint Space Operations Center.

KEYWORDS: 3U, STARE, Colony II Bus, Conjunction, CubeSat, Optical Imager, Orbital debris tracking, Space Situational Awareness, Space Surveillance Network

MASTER OF ARTS

Security Studies

MASTER OF ARTS IN SECURITY STUDIES

THE PERFECT STORM: THE RELIGIOUS APOCALYPTIC IMAGINATION AND PERSONAL DISASTER PREPAREDNESS

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B.A., University of California, Los Angeles, 1989

M.A., Loyola Marymount University, 1995

Master of Arts in Security Studies–December 2011

Advisor: Rodrigo Nieto-Gomez, Department of National Security Affairs

Second Reader: Anders Strindberg, DoD Contractor

Using the Citizen Corps' personal disaster preparedness (PDP) model as a framework, this thesis examines the relationship between religious apocalyptic beliefs and disaster preparedness motivations in the United States. Four focus groups were convened with members of the American public who reported holding religious beliefs that included an end-times doctrine. Findings include the following: 1) estimations of likelihood, impact and response efficacy were not significantly influenced by religious end-times beliefs; 2) beliefs in biblical prophesy did not alter the cognitive heuristics that have been shown to influence personal risk assessment; 3) spiritual beliefs motivated spiritual preparedness while material or secular concerns motivated actual completion of FEMA-recommended preparations; and 4) millennialist beliefs provided high spiritual self-efficacy, but it did not correlate with high material self-efficacy, which is essential to material preparation.

Recommendations are made for leveraging high spiritual self-efficacy in millennialist faith groups to further DHS's mission of disaster resiliency. Suggestions include building a threat/efficacy profile specific to the religious populations that holds strong eschatological beliefs, with distinctions between pre-, post- and amillenialism, as well as Christian and non-Christian populations.

KEYWORDS: Personal Disaster Preparedness, Citizen Corps, Personal Disaster Preparedness Model, Personal Behavior Change Model, Threat/Efficacy Profile, Fear Control, Danger Control, Problem-Focused Coping, Emotion-Focused Coping, Millennialism, Premillennial, Postmillennial, Amillennial.

UNITED NATIONS-LED DISARMAMENT, DEMOBILIZATION, AND REINTEGRATION (DDR) IN THE EASTERN DEMOCRATIC REPUBLIC OF CONGO

Tristan Allen–DoD Civilian

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Master of Arts in Security Studies–December 2011

Advisor: Douglas Porch, Department of National Security Affairs

Second Reader: Eugene Mensch, Center for Civil–Military Relations

The United Nations Organization Mission in the Democratic Republic of the Congo, MONUC, was deployed following the signing of the Lusaka Ceasefire Agreement in July of 1999. A core pillar of the mission, disarmament, demobilization and reintegration (DDR) programs have attempted to address the issue of multiple armed nonstate actors operating, primarily in the country's eastern districts of Ituri, North and South Kivu. MONUC's DDR initiatives can be subdivided into the national DDR program for Congolese combatants and the disarmament, demobilization, repatriation, reintegration and resettlement (DDRRR) of foreign armed groups. Although there has been some success in the DDR(RR) programs over the past 12 years of UN

deployment, rampant insecurity attributed to the presence of armed groups in the DRC continues to plague the east. An examination of the DDR process in the east reveals that although the UN has assisted in the implementation of large, multidimensional DDR and DDRRR programs in, the situational context, voluntary approach, and links to Security Sector Reform (SSR) have all proven inadequate to achieving stability through DDR.

KEYWORDS: Congo, Democratic Republic of; Disarmament, Demobilization and Reintegration; Kivu; Ituri; United Nations; Peacekeeping; MONUC; MONUSCO; DRC; DDR; FARDC; FDLR.

ISLAMISM AND RADICALISM IN THE MALDIVES

Hassan Amir–Lieutenant, Maldives National Defense Force

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Master of Arts in Security Studies–December 2011

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Second Reader: Anshu Chatterjee, DoD Contractor

This thesis aims to explore the rise of Islamism and Islamic radicalism in the Republic of Maldives. It analyzes the causes and grievances which have fueled the rise of political Islam, as well as its radical elements, and the main groups operating in both the political and social space (as well as on the fringes), including an analysis of their main ideological drivers and their social and political outlook.

The closed and conspiratorial nature of the Maldivian political environment, as well as the use of repression to quell political dissent and the manipulation of Islamic religious ideals to cement political position was one factor that led to the rise of Islamism and Islamic radicalism. Another was the rapid modernization that introduced alien concepts and values into Maldivian society. These militated against the traditional norms and cultures and wrought havoc on the social structures, causing intense alienation and social dislocation. All these changes were taking place in a context where Maldives was being infiltrated by radical elements, both local and foreign. They made ample use of the social conditions to craft a narrative that was conducive to their recruitment and radicalization efforts.

KEYWORDS: Maldives, Islamism, Political Repression, Modernization, Marginalization, Terrorism

CONTINUITY OF OPERATIONS PLANS: POLICY AND STRATEGY FOR K-12 SCHOOLS IN THE STATE OF FLORIDA

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M.S., University of Southern Mississippi, 1997

M.S., Auburn University–Montgomery, 1999

Master of Arts in Security Studies–December 2011

Co-Advisor: Nadav Morag, DoD Contractor

Co-Advisor: Robert Simeral, Department of National Security Affairs

Schools, especially those at the K–12 academic levels, have, to this point, not been viewed as critical infrastructure, which is especially true for the state of Florida. Consequently, plans have been slow to be developed that address the continuity of this level of education. This oversight would lead to a loss of academic continuity if a school were damaged or rendered unusable for any length of time, which could cause a cascading failure within the community, which has occurred in other states, such as Mississippi, Alabama, and Missouri. The loss of such facilities has impacted both the economic and operational response to local disasters, which is especially important in those communities that by their very location may be affected by disasters more than other locations. This situation is especially true for the state of Florida as it is impacted by numerous factors

that could cause the cessation of academic requirements by law.

For schools to maintain this academic continuity, Continuity of Operations Plans (COOPs) should be developed. For the state of Florida, guidance is provided, and statutorily identified requirements are identified, for state governmental and university organizations to have COOPs; in the case of K-12 schools, it is not required or identified. This research explores what policy and strategy would be required to develop a K-12 academic level COOP, as well as those elements that would need to be included in its development.

KEYWORDS: COOP, Continuity of Operations Plans, United States Department of Homeland Security, Florida Statute 252, FEMA

RETURN OF THE LOST BOYS TO SOUTH SUDAN: A STRATEGY TO BUILDING A STRONGER SOUTH SUDAN

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Master of Arts in Security Studies–December 2011

Thesis Advisor: Letitia Lawson, Department of National Security Affairs

Second Reader: Anne Clunan, Department of National Security Affairs

This thesis investigates why the Lost Boys, a group of young South Sudanese refugees who have long expressed a desire to return home, are not returning in numbers. It finds that variables generally cited in the existing literature (family ties, securing, occupational opportunities and patriotism) have similar values for those who have resettled permanently in the US, those who have returned to South Sudan, and those who have expressed interest in returning but not done so. Personal factors such as age, marital status, income and education levels are found to contribute to overall risk averseness, which is highest among the resettled and lowest among the returned.

KEYWORDS: Lost Boys, Diaspora, Refugees, repatriation, South Sudan

BRAZIL FOR SALE? DOES SINO-BRAZILIAN TRADE OR INVESTMENT SIGNIFICANTLY INFLUENCE BRAZIL'S UNITED NATIONS GENERAL ASSEMBLY (UNGA) VOTING PATTERN?

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B.A., Alfred University, May 2001

Master of Arts in Security Studies–December 2011

Co-Advisor: Robert M. McNab, Defense Resources Management Institute

Co-Advisor: Christopher Twomey, Department of National Security Affairs

This thesis examines whether Sino-Brazilian trade or investment significantly influences Brazil's voting in the United Nations General Assembly (UNGA). To examine this relationship, this thesis regresses a dataset of UNGA votes, which the literature commonly uses to represent political influence, with trade and investment data. Understanding whether the growing Sino-Brazilian economic relationship politically impacts Brazil is important both to Brazil and to the United States. Any increase in Chinese influence on Brazil may translate into a corresponding decrease in U.S. influence, which may have implications for the health of Brazil's democracy, regional stability, and the U.S. national security.

This thesis crafts, for the first time in the literature on Sino-Brazilian relations, an estimable empirical model that examines whether trade or investment influences UNGA voting behavior between these two nations; this is an improved methodology for evaluating this relationship as previous studies relied on simple correlations. This thesis makes five hypotheses, and tests them with two types of voting affinity measurements using both regression analysis and simple correlations. This thesis finds that Brazil's exports to China have a

statistically significant, positive relationship, and U.S. aid has a statistically significant, negative relationship, to Sino-Brazilian voting affinity.

KEYWORDS: United Nations General Assembly, Voting affinity, China, Brazil, Sino-Brazilian relations, U.S.-Brazilian relations

**THE IMPLEMENTATION OF ORGANIZATIONAL DESIGN PRINCIPLES THROUGHOUT
THE SAN MATEO COUNTY EMERGENCY SERVICES JOINT POWERS AGREEMENT
AND ITS ABILITY TO INCREASE APPLICABILITY, RELEVANCE, AND EFFECTIVENESS**

Edmund L. Barberini, Lieutenant, San Mateo County Sheriff's Office, California

B.A., San Francisco State University, 1992

M.P.A., California State University at Hayward, 2005

Master of Arts in Security Studies–December 2011

Thesis Advisor: Sam Clovis, Department of National Security Affairs

Reader: Larry Schumaker, San Mateo County Sheriff's Office

This thesis examines the application of organizational design principles to, and intergovernmental effort for, the provision of emergency management and homeland security services to a county comprised of twenty individual incorporated cities with a population of over 700,000. A current lack of attention paid to these important factors has led to an emergency management process that does not provide the necessary level of collaboration or the efficient distribution of vital resources. The premise is that the inclusion of special districts in the county's emergency plans and response strategies will promote the optimum level of safety, security, and preparedness. Interoperable communications is presented as an area where an existing Joint Powers Agreement (JPA) can be more comprehensive and effective. The thesis will examine the nature of a series of perceived challenges associated with this joint powers agreement as these factors apply to special districts and interoperable communications. The paper also examines potential solutions to these challenges via the implementation of organizational design principles.

KEYWORDS: San Mateo County, emergency management, homeland security, organizational design, interoperable communications, San Francisco International Airport, Office of Emergency Services and Homeland Security, Emergency Services Council, special districts, intergovernmental agreements, joint powers agreement, San Mateo County Sheriff's Office

THE PREAH VIHEAR TEMPLE: WHAT'S IN A CLAIM?

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Master of Science in Applied Mathematics–September 2009

Master of Arts in Security Studies–December 2011

Co-Advisor: Michael S. Malley, Department of National Security Affairs

Co-Advisor: Sophal Ear, Department of National Security Affairs

This thesis argues that the Preah Vihear Temple territorial dispute is primarily a result of conflicting historical claims tied to the colonial legacy in Southeast Asia. Furthermore, the matter was not actually settled with the 1962 International Court of Justice decision and did not reemerge as a result of domestic politics in Thailand. Greater threats changed the behavior of both countries vis-à-vis the Preah Vihear Temple issue, creating the appearance that issue was actually settled. When those threats abated, the Preah Vihear issue resumed an important role in the relationship between Thailand and Cambodia. This thesis recognizes the importance of domestic political turmoil in Thailand arguing that it functioned as an accelerant on an already contentious issue.

KEYWORDS: Cambodia; Thailand; Preah Vihear; Khmer Rouge; Territorial Dispute; International Court of Justice; Coalition Government of Democratic Kampuchea; Association of Southeast Asian Nations;

U.S. FOREIGN POLICY'S ROLE IN HOMELAND SECURITY: THE EGYPTIAN CASE

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B.S., United States Air Force Academy, May 1997

M.B.A., Touro University International, June 2009

Master of Arts in Security Studies—December 2011

Advisor: Abbas Kadhim, Department of National Security Affairs

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This thesis presents an analysis of United States (U.S.) foreign policy in Egypt during the rule of Hosni Mubarak. It examines the role of U.S. foreign aid and the policy of extraordinary rendition in the perpetuation of Mubarak's authoritarian regime. The research relates the negative externalities associated with these policies to radicalization theory and illustrates how U.S. foreign policy impacts homeland security. Complementary to this discussion, the thesis examines the nature of political Islam in order to challenge the perspective that it is an ideological rival of democracy and to illustrate its role as a stabilizing force in Middle Eastern governments and U.S. national security. Lastly, the research reveals the imbalance of power in the U.S. government contributing to foreign policy that is inconsonant with the proliferation of democracy and the promotion of human rights.

KEYWORDS: Foreign Policy, Foreign Aid, Food Aid, Economic Aid, Military Aid, Inequality, Foreign Direct Investment, Human Development, Extraordinary Rendition, Rule of Law, Radicalization, Terrorism, Political Islam, Realism, Liberal Internationalism, Reform, Democracy, Islamism, Post-Islamism.

LESSONS ON POLICING TERRORISM: STUDYING POLICE EFFECTIVENESS IN ITALY AND GERMANY

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As terrorism threatens a democratic nation, there tends to be an aversion to deploying military forces to combat the internal threat—rightfully so, as it speaks to democratic principles of rule of law. Because of this tendency, democratic nations tend to focus on law enforcement as the key to a successful counterterrorism strategy. This research effort studies the use of police in two comparable western democracies, Italy and Germany, to determine areas in which police effectively supported the national counterterrorism strategy. It suggests a model for analysis that posits police professionalism, preventative methodology, adaptation of technologies, and interagency cooperation as four areas in which improvements can be made to make police more effective. It finds that despite different political and social conditions in each country, changes made within these four areas consistently contributed to successful national counterterrorism efforts. These findings are further relevant to the current state of counterterrorism efforts in the United States. Lessons from these case studies indicate that Homeland Security efforts should focus on centralization of police efforts, legislation to encourage preventive policing, integrated technology efforts, and more interagency cooperation to ensure a successful internal security environment.

KEYWORDS: Police Effectiveness, Terrorism, Counterterrorism, Homeland Security

**THE FUTURE OF SWISS FOREIGN AND SECURITY POLICY: INCREASING
INTERNATIONAL COOPERATION IS THE KEY TO NATIONAL AUTONOMY**

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This thesis investigates the future development of Swiss foreign and security policy, particularly in the context of the continuing trend toward alliances and cooperative policymaking entities in and around Europe. It focuses on two main aspects: One is how international cooperation in general influences national autonomy and neutrality; the other is the specific impact of the Lisbon Treaty of the European Union on Swiss foreign, security, and defense policy. This two-pillar structure informs the central question of this thesis, namely whether increasing international cooperation is the key to Swiss national autonomy and Switzerland's place in the international system of states. For outsiders, at first glance, this question and the whole approach may appear inherently contradictory. How can more or more extensive international cooperation lead to greater national autonomy in Swiss statecraft? It is the aim of this study to investigate and explain how cooperation in one political field can enhance and support autonomy in another political area. The thesis concludes by measuring the value of autonomy and develops some evolutionary options and models for future international cooperation. The final chapter provides an assessment of how much international cooperation is appropriate or recommended in light of the national and international consequences.

KEYWORDS: Switzerland, Foreign Policy, Security Policy, Defense Policy, International Cooperation, National Autonomy, Neutrality

**FROM PLANES TO TRAINS: RESHAPING TSA'S FEDERAL AIR
MARSHAL SERVICE INTO THE FEDERAL TRANSPORTATION
LAW ENFORCEMENT PROGRAM OF TOMORROW**

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This thesis explores the challenges that the Transportation Security Administration (TSA) and its law enforcement arm the Federal Air Marshal Service (FAMS) face in performing the agency's comprehensive mission for securing this nation's transportation systems from terror or criminal threats. Specifically, this research focuses on the underlying reasons for a disparity in resources and capability between TSA's aviation and surface law enforcement activities and identifies possible solutions for better balancing the agency's level of engagement between these two critical transportation sectors. In support of this effort, case study research in this thesis focuses on the best practice activities of an existing, national surface mass transit law enforcement agency, the British Transport Police, and—in recognition of the significant role played by state and local agencies—the Drug Enforcement Administration and Office of National Drug Control Policy's state and local task force programs. The research identifies best practice approaches for supporting both TSA's growing role as a national surface transportation security enforcement agency and better integrating the agency's efforts within the existing framework of state and local law enforcement organizations already hard at work in keeping America's transportation infrastructure safe from terror or criminal elements. Ultimately, this thesis identifies a combination of proposals for internal agency restructuring and direct engagement with state and local partners as a path for enhancing TSA's role as the nation's lead federal agency in transportation security.

KEYWORDS: Transportation Security Administration, Surface Transportation Security, Federal Air Marshal Service, British Transport Police, Drug Enforcement Administration, Office of Drug Control Policy, State and Local Task Forces

THE PEOPLE'S LIBERATION ARMY–NAVY: TAIWAN... AND BEYOND?

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Accompanying the People's Republic of China's (PRC) emergence as a global economic and diplomatic power has been the concurrent phenomenon of its rapid military modernization. This confluence has engendered policy concerns stemming from the notion that if the PRC continues with its current trend of military modernization its regional military influence could at some point potentially rival or surpass that of the United States. This has spawned myriad literature which confronts the subject of the PRC's military modernization.

General consensus indicates that the re-integration of Taiwan and countering United States intervention in such a conflict functions as a primary driver behind the PRC's recent military modernization. There is also a modicum of consensus that the PRC's burgeoning global stature has prompted the PLA to also pursue power-projection type endeavors such as sea line of communication (SLOC) defense and protection. Due to the intrinsic value of naval forces toward these goals, the PLAN functions as a sufficient microcosm through which to identify broad PLA intentions. This thesis objectively surveys the PLAN's modernization in order to determine the extent of the balance between the PRC's military problem sets of Taiwan and SLOC protection as impetus for the PLAN's modern mission paradigm.

KEYWORDS: People's Republic of China (PRC), People's Liberation Army (PLA), People's Liberation Army-Navy (PLAN), Taiwan, sea line of communication (SLOC)

COMBATING HUMAN TRAFFICKING: EVOLUTION OF STATE LEGISLATION AND THE POLICIES OF THE UNITED KINGDOM AND FRANCE

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Human trafficking is a transnational issue that violates human rights and is increasingly associated with organized crime. Since the turn of the century and the passing of the United Nations Palermo Convention Protocols, combating human trafficking has required a coordinated and cooperative effort between local, regional, state, and international institutions. By studying the evolution of legislation and policies of the United Kingdom and France, a more detailed look is presented on how their efforts have positively contributed to the combat of human trafficking. Ultimately, their efforts have combined two approaches: 1) Human rights based approach that reflects the protection of victims and the human rights issues involved with human trafficking. 2) An approach that reflects the criminal nature of human trafficking and its association with organized crime. The convergence of these two approaches to combat human trafficking is also represented in the multitude of European security institutions and the role that both the United Kingdom and France have played in those institutions.

KEYWORDS: Human trafficking, slavery, trafficking, transnational crime, criminal networks, European Security Institutions, United Kingdom, France, prostitution, European Union, NATO, OSCE

**UNMANNED AIRCRAFT SYSTEMS: A LOGICAL CHOICE
FOR HOMELAND SECURITY SUPPORT**

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Unmanned aircraft systems (UAS) have been part of aviation from the beginnings of manned aviation and have become a vital tool of our overseas military and national security operations. Public and private sector interest continues to grow for UAS to be used in a variety of domestic missions, such as border patrol, law enforcement, and search and rescue. With growing concerns over issues, such as border security and critical infrastructure protection, it would seem that UAS would be a logical choice for increased homeland security support, and yet they remain only in limited use. This thesis examined why UAS are not widely used domestically for homeland security support and found that their sluggish integration into the National Airspace System stems from a perceived flight safety risk. However, UAS operations have improved; systems, such as the Predator have flight safety trends equivalent to that of some manned aircraft. Nevertheless, government, private industry, academia, and other UAS stakeholders should continue to work together to further UAS safety. Specifically, they should collaborate to improve UAS component reliability, develop aviation regulations and standards to account for peculiar UAS characteristics, and improve public perception.

KEYWORDS: Unmanned Aircraft Systems, Remotely Piloted Aircraft, Homeland Security, National Airspace System

**ARCTIC SOVEREIGNTY DISPUTES: INTERNATIONAL
RELATIONS THEORY IN THE HIGH NORTH**

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Co-Advisor: Mikhail Tsypkin, Department of National Security Affairs

As an emerging geopolitical hotspot, will the future of the Arctic be dominated by conflict or cooperation among states? With the potential for vast natural resources and the promise of transpolar shipping, the opening Arctic may be the new frontier for global competition. This thesis uses two theories of international relations, neorealism and neoliberal institutionalism, to evaluate the geopolitical landscape of an opening Arctic.

This thesis argues that the characterization of the Arctic as a zone of either competition or cooperation is overly simplistic. While structural neorealist theory can accurately account for some of the Arctic countries' behavior, it is unable to explain forms of cooperation existing and emerging among them. In addition to laying out the overall state of cooperation and conflict among the Arctic countries, this thesis also examines two cases in detail: conflicts between Russia and Norway over the Barents Sea, and the United States and Canada over the Northwest Passage. Neorealism fails to account fully for the emergence of cooperation in the form of an equitable treaty on the maritime delimitation line between Russian and Norway. The international regimes were enablers of inter-state cooperation in the U.S.-Canadian case, and were a contributing factor in dispute settlement.

KEYWORDS: Arctic, Sovereignty, Competition, Cooperation, International Relations, Neorealism, Neoliberal Institutionalism, Canada, United States, Norway, Russia, International Regimes.

**LEVERAGING KNOWLEDGE MANAGEMENT TOOLS TO SUPPORT SECURITY
RISK MANAGEMENT IN THE DEPARTMENT OF HOMELAND SECURITY**

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This thesis examines Knowledge Management (KM) initiatives at the Canadian Institutes of Health Research (CIHR), the United Kingdom (UK), and the National Aeronautics and Space Administration (NASA). The first goal was to identify existing KM approaches that would foster higher levels of knowledge sharing and collaboration among security risk management practitioners within Department of Homeland Security (DHS) agencies to enhance risk-informed decision-making activities. Through the analysis of the three case studies, it was discovered that organizational culture, more than any particular KM process or enabling technology is responsible for moderating the level of knowledge sharing. The KM strategies, policies and implementation mechanisms explored in the three case studies are good models for DHS to consider in order to reduce agencies' uncertainty, aiding decision making and bolstering effectiveness. The Risk Knowledge Management System (RKMS) called for in the DHS Integrated Risk Management Directive will require similar implementation and support structures for DHS to overcome the cultural, process, security, and funding obstacles experienced by the United Kingdom, Canada, and NASA. By using these case studies as models and reflecting on their experiences, DHS will be better positioned to effectively implement and adopt proven KM policies on an agency-wide basis.

KEYWORDS: Tacit, Explicit, Knowledge, Knowledge Management, Risk Management, Organizational Culture

AN IDENTITY OF VIOLENCE: EXPLORING THE ORIGINS OF POLITICAL VIOLENCE

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The United States Department of Defense and development agencies often attribute political violence and instability to poverty and a lack of economic development. However, the cases of Morocco and Algeria challenge this popular assumption as Morocco is considerably poorer than Algeria, yet enjoys greater political stability with less incidences of political violence. Beyond the traditional answers of economic aid and political intervention, these two nations demonstrate that national identity is also necessary in establishing more stable and sustainable practices.

KEYWORDS: Political Violence, Morocco, Algeria, Maghreb, Terrorism, Islamism, Poverty, Political Access, Relative Deprivation, Resource Curse

ORGANIZING THE NATIONAL GUARD TO PROVIDE EFFECTIVE DOMESTIC OPERATIONS

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Over the last 30 years, the National Guard (NG), out of necessity, has needed to look beyond each individual state's boundaries in an attempt to respond better collectively as a NG rather than individual militias. As a result of this shifting need in domestic operations, the current structure of the NG is not conducive to providing efficient and effective support for these homeland security missions.

The NG should establish regional command relationships that extend beyond current state boundaries to respond better to homeland security missions. Establishing regional command relationships will enhance the NG's homeland response better to both natural and man-made disasters. Instead of having the current model of 54 separate entities, the NG with regionalization, could utilize the current model of Federal Emergency Management Agency (FEMA)'s 10 regions or a model similar to that used by Canada Command and the Canadian Forces (CF). Creating a regional structure would allow a better disbursement of limited resources and provide a more efficient response to the incident site. States within the same region would essentially have a compact that would allow other state's NG assets to deploy and operate in a time of need; all controlled by a regional director or commander.

KEYWORDS: National Guard, NGB, Air National Guard, Domestic Operations, FEMA, USNORTH-COM

AVIATION SECURITY: A CASE FOR RISK-BASED PASSENGER SCREENING

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Since September 11, 2001, the United States has invested considerable resources to improving aviation security. Despite technology and procedural improvements, passenger screening remains subject to much criticism. Challenges to the current approach include the assumption that all passengers pose a risk; reactive responses to new threats that are applied broadly to all passengers; high levels of threat uncertainty; a focus on objects versus people; and time constraints on completing the screening process. Combined, these challenges adversely impact performance and result in poor public acceptance of government efforts to protect the commercial aviation sector from terrorist attacks. Questions persist regarding the long-term efficacy and sustainability of the current approach and the availability of a better model.

The approach used by Israel and a risk-based approach that calibrates security measures to groups of passengers based on risk are two frequently offered alternative screening models. This thesis evaluates the current and alternative models using security effectiveness, risk mitigation, constitutional permissibility, social acceptance, and political feasibility as evaluation dimensions. This evaluation of policy options allows a side-by-side comparison of the three models and demonstrates that adopting a risk-based security approach to passenger screening is the best option for the U.S. government to pursue.

KEYWORDS: Aviation Security; Risk-Based Security; Visual Search; Terrorism Deterrence; Passenger Screening, First Amendment, Fourth Amendment, Fifth Amendment; Risk Mitigation; Israeli Aviation Security, X-Ray Screening, Transportation Security

ALTERED STANDARDS OF CARE: AN ANALYSIS OF EXISTING FEDERAL, STATE, AND LOCAL GUIDELINES

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A disaster with mass casualties or event involving a weapon of mass destruction (WMD) is a profound, life-impacting event that can lead to further devastating consequences. Under austere conditions, however, the implementation of altered standards of care can greatly increase the quality of life of individuals injured by such an event. This thesis evaluates, compares, and contrasts, at the various federal, state, and local levels, guidance documents for altered standards of care and presents a policy recommendation for the inclusion of triggers, guaranteed minimums of care, and legal immunity into existing planning guidance documents for altered standards of care at the federal, state, and local levels. In formulating this policy recommendation, consideration was given to ethical values that should be used to develop policies for altered standards of care, which are recommended to guide and support decision making during both preparation and response at different levels of government.

KEYWORDS: Altered Standards of Care, Disaster, WMD, Mass Casualty, Guidance, Triggers, Minimums of Care, Legal Immunity, Ethics

A DECADE OF EXPERIENCE: WHICH NETWORK STRUCTURES MAXIMIZE FIRE SERVICE CAPACITY FOR HOMELAND SECURITY INCIDENTS IN METROPOLITAN REGIONS?

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The Philadelphia metropolitan region is the fifth most populated metropolitan region in the United States. One method of providing homeland security services involves the use of regional response networks to achieve the capacity required to respond to terrorist incidents. The Philadelphia metropolitan region presents a challenge of coordination because there are two FEMA regions, two state borders, two state offices of emergency management, eight county emergency management offices, and 317 local government emergency management coordinators involved.

This thesis examines three regional networks to identify the features of successful regional arrangements. The research includes the assessment of leadership, structure, and regional performance to identify features that can serve as recommendations for the Philadelphia Metropolitan Region. The research reviews the impact of federalism on regional networks and identifies one system—the Metropolitan Planning Organization—that serves shared federal, state, and local functions within regions. Recommendations center on creating a regional integrative network that utilizes existing fire service capacity to deliver functional homeland security.

KEYWORDS: Regional networks, fire service deployment, homeland security, Philadelphia metropolitan region, FEMA, regional fire service network.

NOTES ON A NATIONAL STRATEGY FOR GLOBAL EDUCATION

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Scholarly literature and anecdotal reports have long suggested that Americans lack the language skills and cultural competence to carry out the nation's business effectively, in both the public and the private sectors, despite almost 75 years of federal support for cross-cultural and language education. This study sought to answer the questions whether there is in fact a problem; if so, why; and whether a national strategy for global education could contribute to the solution of the problem. Semi-structured interviews were held with a convenience sample of respondents connected with the intelligence, defense, diplomatic, and academic communities, and the private sector, and the results transcribed and coded thematically. Results were supplemented by relevant literature. Although the results were not unanimous, the respondents generally agreed that improvements in global education were critical to national and homeland security, including the nation's ability to remain competitive in an increasingly global economy, and that a national strategy would be a useful tool for providing the necessary political leadership and public education. The respondents also offered preliminary thoughts on how a national strategy might be developed, what goals it might seek to achieve, and issues to be considered in planning.

KEYWORDS: Intercultural education; multicultural education; global education; language education; language skills; cultural competence; homeland security; national strategy

PUBLIC SECTOR UNIONIZATION: UNDERSTANDING THE RISE IN MEMBERSHIP RATES AND IMPACT TO HOMELAND SECURITY

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Public sector union membership rolls will swell by over 40,000 transportation security officers (TSO) as the Transportation Security Administration (TSA) embarks on transitioning to a unionized screener workforce. Proponents argue that screening operations will be in jeopardy as poor performing screeners will be difficult to remove for cause, attention will be focused on union issues rather than security measures, and the threat of work slowdown or unofficial strikes if union demands are not met could have nationwide economic repercussions. The TSA organizing as a unionized workforce has parallel similarities to another unionized aviation industry federal agency—the Professional Air Traffic Controllers Organization (PATCO). Disgruntled with years of attempted bargaining between PATCO and the Federal Aviation Association (FAA), PATCO staged an unofficial work strike in August 1981 that temporarily halted air traffic in the United States. As airlines were forced to cancel flights, this strike brought national attention to the impact that federalized workers can have on national security and the economy. Federal agencies with national and homeland security responsibilities must remain operationally agile. The economic devastation resulting from a TSA work strike could cripple the complex transportation network of aviation, rail, pipeline, highway, cargo, maritime, and mass transit.

KEYWORDS: Homeland Security, Transportation Security Administration, Aviation, Screening, Public Sector Union, American Federation of Government Employees

**SMART PRACTICES IN BUILDING INTERORGANIZATIONAL
COLLABORATIVE CAPACITY TO STRENGTHEN THE FLORIDA
COMPREHENSIVE DISASTER-MANAGEMENT ENTERPRISE**

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This research demonstrates how the building of Interorganizational Collaborative Capacity served as an enabler for effective change efforts in Florida and constructs a narrative describing smart practices that may be leveraged by other professionals to enhance their own interorganizational collaborative capacity and efficiency efforts. Florida is viewed by many professionals as one of the best-prepared states in the field of emergency management. It built a credible reputation over the past 20 years through increasingly effective responses to catastrophic hurricanes, floods, tornados, wildfires, tropical storms and environmental threats. In particular, the Florida State Emergency Response Team evolved during this time as a result of many change efforts following the initial response to Hurricane Andrew in 1992, an event viewed by many as the initial starting point for the creation of the modern Florida emergency management era. This research examines Florida's Comprehensive Disaster Management evolution from 1992 to 2004 using after-action reports for major emergency events utilizing Hocevar, Thomas and Jansen's model of Inter-organizational Collaborative Capacity and focuses on the factors that served as catalysts for increased interagency cooperation and efficiency.

KEYWORDS: Florida, Interorganizational Collaborative Capacity, ICC, Disaster Management, Smart Practices, Florida's State Emergency Response Team (F-SERT), Florida's Comprehensive Disaster Management (CDM) Enterprise

SCENARIOS FOR RUSSIAN AGRICULTURAL DEVELOPMENT TO 2021

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Russia's agricultural sector has experienced profound and fundamental change over the past two decades in response to the dissolution of institutions built under the Soviet regime. The relative chaos of the 1990s gave way to increased state intervention under Presidents Vladimir Putin and Dmitri Medvedev, contributing to a broad agricultural recovery. The present study examines the possible future course of agricultural development by presenting three scenarios depicting the challenges and opportunities the sector may face within alternative development contexts.

KEYWORDS: Russia; Agricultural Development; Rural Development

THE PERFECT STORM: CHANGING NATIONAL POLICIES TO REDUCE FLOODING IMPACTS AND COSTS

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Flooding matters. As the nation's most common natural hazard, flooding costs this nation economically, disrupts communities and commerce, and renders communities and extrapolated—the nation—less than fully postured for other homeland security threats. It will not get better. Demographics leading to more people living in flood-hazard areas and forecasted increases in precipitation are converging to create the perfect storm. This thesis examines two national policies that can influence the impact and costs of flooding: The National Flood Insurance Program and the Robert T. Stafford Disaster Act. Examination and research reveals that the NFIP has failed to achieve its goals of reducing flood losses and political, economic, and societal factors serve to make reforming the NFIP effectively less than likely. A policy options analysis examines how changes to the Stafford Act might influence a reduction in the impact and costs of flooding where the political, economic, and societal factors at play may lend to favorable implementation consideration. The policy options include changing enforcement and incentive provisions of the Stafford Act along with a proposal to begin a national dialogue on mitigation through the creation of a National Mitigation Collaborative Consortium.

KEYWORDS: Mitigation National Flood Insurance Program (NFIP) FEMA, Hazard Mitigation Grant Program (HMGP), Flood, Stafford Act, Disaster Assistance

INTELLIGENCE-LED RISK MANAGEMENT FOR HOMELAND SECURITY: A COLLABORATIVE APPROACH FOR A COMMON GOAL

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The concept of risk management provides the foundation of the homeland security enterprise. The United States of America faces numerous complex risks ranging from a series of natural hazards, pandemic disease, technological hazards, transnational criminal enterprises and acts of terrorism perpetrated by intelligent adversaries. The management of these risks requires a strategic collaborative effort from the intelligence and risk analysis communities and many stakeholders at all levels of government, including the private sector. Paradoxically, a decentralized collaborative approach to homeland security risk management may produce better results than a hierarchical central approach driven by the U.S. Department of Security, as this thesis suggests. Intelligence-Led Risk Management represents the fusion of intelligence with risk management in a collaborative framework to promote effective risk management throughout the homeland security enterprise. Concepts from strategic thought and planning, such as the Cynefin Framework, Appreciative Inquiry, and Quantum Planning provide vehicles to promote collaboration and thoroughly explore the spectrum of risk management options available to the homeland security enterprise. Decentralization of homeland security risk management to states with the application of Intelligence-Led Risk Management through the network of fusion centers will promote collaboration and yield a stronger risk management culture within the homeland security enterprise.

KEYWORDS: Risk; Risk Management; Risk Analysis; Intelligence; Risk Ranking; Mitigation; Fusion Centers; Collaboration; Complexity; Terrorism; Natural Hazards; Intelligence-Led Risk Management; Strategy

**WHY NOT EXTENDED DETERRENCE FROM ROMANIA? U.S. EUROPEAN
PHASED ADAPTIVE APPROACH (EPAA) AND NATO'S BALLISTIC MISSILE
DEFENSE (BMD) SITE AT DEVESELU AIR BASE IN ROMANIA**

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In September 2011, the United States and Romania signed the cooperative anti-missile agreement for the United States to build, operate, and maintain ballistic missile defense (BMD) system elements at Deveselu Air Base, the previously confirmed selection for the Romanian site of Phase II of the so-called European Phased Adaptive Approach (EPAA). The plans envision Deveselu Air Base hosting land-based Standard Missile-3 (SM-3) interceptors by 2015, as part of the Aegis Ashore (AA) System.

This vision is important because the United States, Romania, and other NATO allies face ballistic missile threats, particularly amid the increasingly unsettled situation in the Middle East. The EPAA also marks a major development in the broader context of policy and strategy both within the North Atlantic Treaty Organization and between NATO and other states in the regions, as NATO and the United States thereby both significantly extend deterrence in expanding their BMD reach.

This thesis tests how the plans for the deployment of U.S. BMD system elements in Romania reflect and support the U.S. and trans-Atlantic Alliance strategic purposes and what the political significance of this deployment is in U.S.-Romanian relations, in U.S. relations with other NATO allies and in the Alliance as a whole, and in U.S.-Russian and NATO-Russian relations.

KEYWORDS: Romania, NATO, U.S. European Phased Adaptive Approach (EPAA), ballistic missile defense, Deveselu, extended deterrence, defense policy, defense strategy, standard missile-3, Aegis Ashore System, Russia, Alliance, relations

EMERGENCY RESPONDER PERSONAL PREPAREDNESS

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Citizens have an expectation that emergency responders will come to their aid during emergencies. There is the general assumption that these responders and the agencies they work for are prepared for any type of event. With a core element of any disaster response being the capability of the emergency responders, a lack of personal preparedness by emergency response personnel is likely to be highly detrimental and reduces this capability when responders are needed to respond to a catastrophic event. Past incidents and research has indicated that emergency responders may not respond until they ensure their own families safety. Emergency responders do not have the option to assist voluntarily during a disaster—they must respond to ensure citizen safety and security while maintaining order.

This research used a nationwide survey of emergency responders to determine why emergency responders are not personally prepared and what factors may influence increasing their personal preparedness level. The result of this research identified three reasons why emergency responders do not personally prepare for disasters and concludes with recommendations that involve five incentives or motivations on how emergency response agencies can increase personal preparedness among their personnel.

KEYWORDS: Preparedness, emergency responder preparedness, family preparedness, resilience, emergency responder resilience, Michigan State Police, behavior change, personal preparedness, disaster

**THE VIOLENT ISLAMIC RADICALIZATION PROCESS:
A FRAMEWORK FOR UNDERSTANDING**

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The violent Islamic radicalization process is understood differently across disciplines within the homeland security enterprise. Radicalization of U.S. citizens is an emerging threat within the homeland. Current theories and models of the radicalization process offer a linear progression or focus heavily on religious behaviors. When those processes are relied upon to inform policy or procedures for interdiction, civil liberties issues arise. Some theories or models rely on a demographic profile of terrorists. Research suggests that a demographic profile of terrorists is nonexistent. This study analyzes prevailing theories and models that explain radicalization. Using appreciative inquiry, a framework is identified that comprehensively captures the contributions of various theories and models that compose and best explain the dynamics of the radicalization and mobilization process. The identified framework, developed by the National Counterterrorism Center, is comprehensive and suitable for informing training, and counter-radicalization policies and measures within the United States. This research examines radicalization strategies from abroad, as well as studies that identify behavioral indicators of radicalization and mobilization, which establish the basis for future research for behavioral profiling of terrorists. This research recommends a counter-radicalization policy theme that begins with the development of radicalization process expertise and understanding across the homeland security enterprise.

KEYWORDS: Radicalization process, Counter-radicalization, Counterterrorism, Social Identity Theory, Mobilization, Model, Framework, Homegrown Violent Extremists, Homeland Security Enterprise, Globalization, Diaspora, Slippery Slope, Pathway to Radicalization, Staircase Metaphor, Behavioral Profiling, Preventive Policing, Behavioral Indicators

**TWO DILEMMAS AND VICIOUS CYCLE OF CONFRONTATION
ON THE DIVISION OF THE KOREAN PENINSULA**

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Master of the Arts in Security Studies—December 2011
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Second Reader: Christopher P. Twomey, Department of National Security Affairs**

The continuing division of the Korean Peninsula is the ongoing feature in inter-Korean relations, with repeating cycles of confrontations and conciliations. This thesis identifies contributing factors to the ongoing division from the intricately entangled security relations between the U.S., PRC, ROK and DPRK: rivalry and alliance. While struggling for security, they become either a security provider or a threat to other players. Each relational linkage provides an imperative security framework for the two Koreas, but these also have paradoxical security implications—“two dilemmas”—for inter-Korean reconciliation.

In the relations of two sets of rivalries—the U.S.–PRC and the ROK–DPRK, the Prisoner’s Dilemma explains how the rational player’s interest-seeking behavior produces deadlock, even though reconciliation provides better results. Also, in the relations of two sets of alliances, the U.S.–ROK and the PRC–DPRK,

the alliance security dilemma explains how divergent interests and threat perceptions between allies work against any reconciliation policy. Moreover, the interaction of rivalry and alliance produces paradoxical security dynamics among the four players, and drives them into the vicious cycle of confrontations. In short, these intricately intertwined and dilemma-contained security relations induce significant conflict between the four players for either confrontational or conciliatory policies.

KEYWORDS: Alliance Security Dilemma, Prisoner's Dilemma, U.S.-ROK alliance, PRC-DPRK alliance, U.S.-PRC Rivalry, ROK-DPRK Rivalry, Alliance, Rivalry, Reconciliation, Reunification

DENATIONALIZED CITIZENSHIP THEORY: WHAT IS THE ROLE OF CITIZENSHIP THEORY IN HOMELAND SECURITY?

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The homeland security community interacts with U.S. citizens every day and the national strategy for homeland security calls for an active and engaged citizenry to play a significant part in homeland security. The naturalization process that makes new citizens and to the many international variables, such as dual citizenship, that affect any interaction with many naturalized U.S. citizens is often overlooked. This thesis presents a qualitative synthesis of the different types of citizenship theory to discover what aspects of this theoretical work are relevant to homeland security. The synthesis of the global, cosmopolitan, diaspora, multicultural, post- and transnational types of citizenship theory produced recommendations for the homeland security community to pay greater attention to and act upon:

- The greater and continuing interaction between immigrants and their countries of origin.
- The countries of origins' greater interest and continuing interaction in their migrant populations.
- Greater understanding of immigrant cultures and histories to better enhance interaction.
- The need to make U.S. citizenship significant to naturalized citizens to keep them engaged here as much as they are with their countries of origin.
- The need to standardize the U.S. government's policy towards dual and multiple citizenship status.

KEYWORDS: Citizenship, Loyalty, Allegiance, Radicalization, Denationalized, Diaspora, Multicultural

FRAGMENTATION OF DHS PUBLIC CORRUPTION INVESTIGATIONS: OPTIONS TO LEVERAGE OVERLAPPING JURISDICTION AND ENHANCE COLLABORATION

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Second Reader: Patrick Miller, DoD Contractor

From maintaining aviation security, to patrolling the country's borders, to granting immigration documentation, the Department of Homeland Security has tremendous responsibilities. As such, it is imperative that the Department has a robust internal investigative mechanism to prevent, deter and investigate allegations of public corruption. Currently, there are eight agencies that have authority to conduct public corruption investigations within the Department. For every allegation of corruption within the Department, there are three agencies that have concurrent jurisdiction to investigate; in some cases, four agencies have overlapping jurisdiction to investigate the same matter. To maximize efficiency of operations, avoid duplication of efforts

and best serve the American public, collaboration is essential. This thesis will examine other domestic and foreign institutions that have grappled with overlapping jurisdiction and leadership issues and provide analysis as to how those lessons learned can be applied to the DHS anti-corruption community. Several policy options are provided to enhance collaborative efforts, improve information sharing and create synergy of efforts. The policy options include: recognition and utilization of an already existent megacommunity; expanding the cross-designation of agency personnel; and the formation of public corruption task forces.

KEYWORDS: Cooperation, collaboration, investigations, overlapping jurisdiction, law enforcement, Department of Homeland Security, leadership, consolidation, force multiplication, corruption, task forces, megacommunities

THE ALIGNMENT OF SMALL STATES: SINGAPORE AND VIETNAM

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China's economic growth and military modernization over the past decade presents a foreign policy challenge to Southeast Asia. The balance of power in Asia, so long dominated by the U.S., is beginning a shift toward China. At the same time, China is growing more assertive toward its neighbors. This thesis seeks to explain how Singapore and Vietnam are reacting to this change. Using the existing literature and the historic example of Finland's policies in the last century, it presents alignment behavior as a negotiating process between states. These negotiations are both constrained and driven by realist concerns, existing institutions and domestic politics, which affect the speed and the form that changing relationships and alignments take. Presented in this manner, this theory offers two distinct explanations for the policies of Vietnam and Singapore. In Vietnam, the concern over the threat of China, coupled with a lingering mistrust of the United States, has led to a distributed balancing approach that spreads Vietnam's security reliance among a number of regional powers. In Singapore, the limited threat China presents and the resolution of other regional threats relaxes the need to balance and enables Singapore to view the rise of China as an opportunity.

KEYWORDS: China, Singapore, Vietnam, Alliance, Alignment, Balance of Threat, Small States

CIVIL-MILITARY OPERATIONS IN THE POST-CONFLICT ENVIRONMENT: NORTHERN UGANDA CASE STUDY

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Second Reader: LTC Michael Richardson, USA, Department of Defense Analysis

Northern Uganda has suffered a violent civil conflict between the Government of Uganda and the Lord's Resistance Army (LRA), for over two decades. The conflict has resulted in over 1.6 million internally displaced persons within Uganda, as well as over 66,000 children abducted and forced into soldiering. In 2006, the LRA could no longer sustain the fight against the Government of Uganda and fled to into Southern Sudan. Northern Uganda shifted from a combat zone into an extremely complex post conflict environment. The Government of Uganda began reconstruction efforts to piece the region back together with a series of programs, projects and donors. Central to the overall efforts towards security and development was the Ugandan military, the UPDF. The UPDF conducted a series of civil-military operations to assist in reconstruction and post conflict operations within its own borders. Using the Northern Uganda post conflict environment,

this study will explore the impact of civil-military operations within the overall of post conflict operations, to include stability and counterinsurgency operations. Through the Ugandan example, this study will determine the salience of civil military operations in post conflict operations as both a force multiplier and a means to gain popular support for the government.

KEYWORDS: Northern Uganda, Civil-Military Operations, Post Conflict, Uganda People Defense Force

THE REBELLION OF ENLISTED PERSONNEL AND DEMOCRATIZATION IN MALAWI

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Second Reader: Anne L. Clunan, Department of National Security Affairs

This thesis analyzes the factors that led to the insubordination of enlisted personnel of the Malawi Defense Force (MDF), which happened during the transition to democracy in December 1993. The regular enlisted members of the MDF engaged in an armed conflict with the armed wing of the ruling Malawi Congress Party (MCP)—Malawi Young Pioneers (MYP). The MYP was then completely disarmed and disbanded in an operation called “Operation Bwezani,” which was started by the enlisted personnel without proper orders from the officers’ corps or the general commanding the MDF.

The author argues that competition of military resources, corruption among generals, officers’ promotion goals, poorly defined roles of the MYP, and little incentive among senior military leadership to confront the president to push for free and fair democratic elections were the main factors that led to the rebellion of the enlisted personnel. The moment in which military personnel turned on Malawi’s authoritarian government by disbanding the MYP, helps us to predict future cases in which the armed forces may withdraw their support from a nondemocratic regime, thereby triggering instability and potentially space for the installation of democracy.

KEYWORDS: Rebellion, Disarmament, Democratization, Civilian Control

**PRIVATE CONTRACTING OF U.S. AIR FORCE COMBAT
CAPABILITIES IN FUTURE CONFLICTS**

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This thesis examines the increasing role and growing dependence on private military companies (PMCs) by the U.S. government, in particular, the U.S. Air Force (USAF). It highlights potential areas of concern when using PMCs to provide combat capabilities, and offers possible solutions for solving or mitigating these problems in future conflicts. The main argument of this thesis is that the role of PMCs has become blurred with traditional governmental functions, and that their use in future conflicts should be evaluated based on monetary, personnel, and material savings for the USAF and its abilities to balance international and domestic political needs and objectives, while accomplishing its national security mission.

This thesis will answer the following questions: How does the USAF use PMCs in aspects of control, oversight, and accountability during conflicts, and what are the main challenges for the USAF concerning contracting PMCs to provide combat capability?

KEYWORDS: Inherently governmental functions, private military companies, United States Air Force, com-

bat capabilities, contractors.

**FAR AWAY FROM THE REVOLUTION: UNDERSTANDING THE CUBAN
REVOLUTIONARY ARMED FORCES MISSION CHANGES**

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Advisor: Thomas C. Bruneau, Department of National Security Affairs

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Over five decades have passed since the triumph of Fidel Castro's guerrilla army in the revolution that removed Cuba's dictator Fulgencio Batista. Since then, the Cuban Revolutionary Armed Forces (Fuerzas Armadas Revolucionarias, FAR)—with roots in the revolutionary movement—has redefined its role and missions several times up to the current regime. This thesis explores how the FAR has adapted to mission changes from the end of the revolution to the post-Cold War period (1959–Present) while remaining loyal to the revolution. The FAR's commitment to the state and subordination to political leaders is particularly interesting now with its most recent mission shift into entrepreneurship. This thesis, finally, seeks to analyze the extent of political influence the FAR has exercised and explore potential linkages between shifts in political power and mission change. First, the thesis will chronologically explore the development and progression of the FAR as an institutional actor, paying particular attention to the militarization of the Cuban economy. Second, the implications of all these changes are placed in context by exploring the FAR's power dynamics with other political institutions. Lastly, it will assess the importance of the domestic dimension of the FAR and the contributions to the Cuban economy against the relevance of the Cuban Communist Party (PCC).

KEYWORDS: Cuban Revolutionary Armed Forces, Mission Trajectory, Civil-Military Relations, Institutional Cohesion

**THE IMPACT OF SINO-INDIAN ENERGY SECURITY AMBITIONS
ON BURMA'S DOMESTIC AND FOREIGN POLITICS**

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The rivalry between China and India poses significant challenges for the regional security of Southeast Asia, and particularly for the security of Burma. Within the context of their rivalry, China and India compete over oil and gas resources in Burma. They seek not only to establish energy security for their own countries, but to reaffirm an economic and political presence in the region. This thesis will explore the impact of China and India's pursuit of energy resources on Burma's domestic and foreign politics. It will show how, over the last few years, the competitive agendas of these two countries over the natural resources in Burma, has strengthened the military junta in the country. In particular, it will detail how, with the revenues from selling its energy resources, the government of Burma is able to operate with relative autonomy and impunity in formulating authoritarian domestic policies and pursuing foreign policy. It suggests that progress on democratization and liberalization in Burma is likely to occur more slowly as a result of this access to energy revenue.

KEYWORDS: Energy Security, Burma, Myanmar, Rentier State, Sino-Indian Rivalry, Chinese Energy Secu-

rity, Indian Energy Security

A NEW TYPOLOGY FOR STATE-SPONSORED INTERNATIONAL TERRORISM

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Second Reader: Erik Dahl, Department of National Security Affairs

State sponsorship of terrorism, though not as prevalent as in previous decades, is still a complex phenomenon our government has yet to adequately address, despite the threat it continues to pose to our national security. Current U.S. policy toward state sponsors of terrorism is constrained by a number of laws, which mandate a host of economic and diplomatic sanctions be put in place when a state is designated as a sponsor of terrorism. As such, policymakers must carefully consider all of the complex ramifications before labeling an offending state for fear of alienating necessary allies and harming the international economy.

This paper argues a more effective response to state-sponsored terrorism can be found through a deeper understanding of the phenomenon. To this end, a new typology for state-sponsored terrorism is presented, offering policymakers a nuanced approach to dealing with states that choose to employ terrorist organizations. The primary benefit of such an approach is the inherent flexibility to tailor U.S. response to the precise relationship between the terrorist organization and its state sponsor. States currently on the State Department's list of state sponsors of terrorism and states that should be examined, detailing the shortcomings of current U.S. policy and the advantages of the proposed typology.

KEYWORDS: state-sponsored terrorism, Iran, Hizballah, Syria, HAMAS, Libya, Palestinian Islamic Jihad, PIJ, Sudan, Abu Nidal Organization, ANO, Pakistan, Saudi Arabia, Cuba, Venezuela, U.S. State Department, NORAIID, Provisional Irish Republican Army, PIRA, al Qaeda

**AN ASSESSMENT OF THE NEW YORK STATE ENHANCED
SECURITY GUARD TRAINING LEGISLATION AND ITS
EFFICACY ON SECURITY OFFICER PREPAREDNESS**

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This thesis analyzes the results of a survey instrument administered to a random sample of New York City security officers in order to understand the relationship between job training and turnover and, in turn, the effect of high turnover on the preparedness and effectiveness of that population in performing its duties. Replicating a 2004 survey sponsored by the New York City Public Advocate Office, which exposed poor training and rampant turnover among security guards and resulted in the August 2005 New York State Enhanced Security Guard Training legislation, this thesis seeks to determine changes in and correlations among those phenomena by employing bivariate analysis, independent t-test, and Cronbach's Alpha methods. The data analysis reveals correlations between employment conditions—including training and advancement opportunities—and retention, and thus contributes to the discourse surrounding the role of private-sector and non-sworn personnel in the Homeland Security Enterprise.

KEYWORDS: Enhanced Security Guard Training, NYPD, Security Officer, Training, NYPD Shield, Lower

Manhattan Security Initiative.

**ORGANIZING THE COUNTERTERRORISM UNIT OF THE REPUBLIC
OF MAURITIUS: USING THE MAIN COUNTERTERRORISM AGENCIES
OF THE UNITED STATES OF AMERICA AS MODELS**

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In response to the rise of terrorism in the South West Indian Ocean and its potential to threaten national stability and security, the government of the Republic of Mauritius recently established a counterterrorism unit (CTU) under the supervision of the National Counter Terrorism Committee (NCTC). This thesis examines the challenges involved in organizing this unit, whose mission is to collect and analyze all terrorism-related intelligence, and to disseminate the finished product to the country's law and order apparatus. This agency will be vital for integrating national counter terrorism efforts and strategies. However, this laudable effort to make the Republic of Mauritius more resilient to the threat posed by terrorism will require significant legal and organizational changes. This thesis examines similar organizations in the United States and elsewhere in order to develop lessons learned and best practices that can be applied in Mauritius. This study finds there will be a need to pool all available resources and bring multiple strands of expertise under one roof in a judicious mix of the state's defense, diplomatic, intelligence and law-enforcement capabilities.

KEYWORDS: Information sharing, interagency cooperation, counterterrorism.

AN INSPIRATION FOR DEMOCRATIZATION IN THE MIDDLE EAST: TURKEY

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For many years, countless individuals have debated the compatibility of Islam and democracy. Some scholars argue that Islam and democracy are incompatible because of the nature of Islam and its core teachings, while others assert the idea of their compatibility by emphasizing democracy's universality. Turkey, which is a predominantly Muslim, yet democratic country, is given as an example for the coherence and compatibility of Islam and democracy. More recent historic developments, beginning in Tunisia and continuing with other Middle Eastern countries, have triggered debates about the future direction of the political structure of these countries. The possibility of relatively strong fundamentalist Islamist parties taking over after the collapse of existing governments has led to a reassessment of diverse democratization paths among not only Middle Eastern but also Western countries. Because of Turkey's strategic location, its common history with the Middle East, its political and economic strength, and most importantly, because of its unique character as a predominantly Muslim yet secular, democratic, and modernizing, Turkey again is being reviewed as a potential role model for countries in the Middle East. This thesis, after examining the compatibility of Islam and democracy and the core reasons for the democracy deficit in the Middle East, discusses the consideration of Turkey as a model of democratization for predominantly Muslim countries in the region. Moreover, it explores how Turkish historical experiences with democratization can teach us about the process of attaining a democratic society, regardless of its religion.

KEYWORDS: Democracy, Islam, Middle East, Turkey, Model, Inspiration

STILL A SPECIAL RELATIONSHIP? THE SIGNIFICANCE OF UNITED STATES– UNITED KINGDOM RELATIONS IN THE TWENTY-FIRST CENTURY

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The so-called special relationship between the United States and the United Kingdom has been a signal feature of the foreign relations of the United States and the United Kingdom, especially in the past ten years of the war against terror. As such, the topic represents an important theme of policy for U.S. officers who serve in the United Kingdom or elsewhere. The present thesis seeks to understand how leading institutions and responsible figures in Britain view the special relationship within the contemporary strategic and political context. Furthermore, the thesis analyzes the nature, character, and durability of this strategic idea in UK statecraft from a British perspective in three case studies: a.) the Iraqi campaign of 2001–2010; b.) the Afghan campaign, 2001–present, and c.) the most recent Libyan episode of the North Atlantic Treaty Organization's (NATO) operations in 2011. In particular, this inquiry comprehends the Special Relationship as a feature of British diplomatic and strategic culture, and as an expression of shared values and institutions the character of which is vital for those charged with service in an Anglo-American context as well as NATO.

KEYWORDS: United Kingdom, United States, Special Relationship, Anglo-American Relations, Iraq, Afghanistan, Libya, United States–United Kingdom Relations, Alliance

DEVELOPING A MODEL FUSION CENTER TO ENHANCE INFORMATION SHARING

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Co-Advisor: Nadav Morag, DoD Contractor

Co-Advisor: Patrick Miller, DoD Contractor

Fusion Centers are in a unique position to provide the necessary collaborative space to bring the federal intelligence community together with state, local and tribal initiatives to support homeland security efforts at the grass roots level. Fusion Centers are described as a collaborative effort of two or more agencies to share, or more importantly, fuse information or data from multiple sources. Although, fusion centers have developed at different intervals, the U.S. Department of Homeland Security has provided guiding documents to support fusion center maturation. This research examines these documents and proposed strategies incorporated into four proficient fusion centers in the Northeast Region of the United States to identify best or smart practices, success stories and areas for improvement.

There has been a plethora of literature written concerning fusion centers since the tragedies of September 11, 2001. These categories of the literature include: official documents, guidelines and lessons learned for intelligence input, civil liberties safeguards and protections and literature dealing with the intelligence cycle and information sharing. The focus of this thesis is to examine correlation between the implementation of the current United States Department of Homeland Security and U.S Department of Justice suggested Fusion Center Guidelines, and the employment of these guidelines in the successful development of a model fusion center.

KEYWORDS: Fusion Centers, Fusion Center Guidelines, Baseline Capabilities, Mission Statements, Collaborative Environment, Protecting Privacy and Civil Liberties in Fusion Centers.

**BELL AND BANNER: ARMENIAN REVOLUTIONARIES
AT THE END OF THE OTTOMAN EMPIRE**

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Second Reader: Abbas Kadhim, Department of National Security Affairs

This study begins by addressing the political, social, and economic conditions in the Ottoman Empire in the seventeenth and eighteenth centuries in order to provide the historical context for the emergence of Armenian revolutionaries. It then details the attempts at reforming the empire by the Tanzimat and Hamidian regimes, the effect these reforms had on social and economic conditions for provincial Ottoman Armenians, and the steps those within the empire but especially among the Armenian diaspora took to adopt revolutionary tactics in attempting to alleviate conditions in the Armenian fatherland. Specific attention will be paid to the programs and activities of the major parties that have comprised the Armenian Revolutionary Movement: the Dashnaktsutun, the Hunchaks, and the Armenakans. This study then reviews revolutionary activity amidst the rise of the Committee of Union and Progress, particularly the Dashnaktsutun who were most active during this period, in an effort to complete a survey of Armenian revolutionary activity. Finally, it concludes with general observations regarding the process by which some Armenians, who had at one point been considered the Ottoman Empire's "loyal millet," decided to arm themselves first in self-defense in pursuit of autonomy and then to engage in terrorism as an acceptable tactic in carrying out their strategy.

KEYWORDS: Armenian Revolutionaries, Dashnaktsutun, Dashnak, Hunchak, Armenakan, Terrorism

**ENDING AMERICA'S ENERGY INSECURITY:
HOW ELECTRIC VEHICLES CAN DRIVE THE
SOLUTION TO ENERGY INDEPENDENCE**

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Second Reader: Ted Lewis, Department of Computer Science

The homeland/national security threat posed by the United States' dependence on foreign oil has been part of the American discourse for years; yet nothing has been done. No pragmatic, realistic step-by-step plan has been pursued to end this scourge on the American people. The solution can be found in the problem. Net imports of oil account for approximately 50 percent of the oil the U.S. consumes. Likewise, 50 percent of oil consumed in the U.S. is consumed as motor gasoline. If overnight the U.S. stopped using oil to power its vehicles, if overnight drivers switched to electric vehicles, then overnight the U.S. would become energy independent. Using historical data to establish the effect of gasoline price changes on consumer vehicle choice, a predictive model has been created showing the expected switch to electric vehicles if the price of gasoline increases and the cost of electric vehicles decreases. There is a cost to energy independence: two to five dollars per gallon of retail gasoline sold. If monies raised from the tax are used to lower the price of electric vehicles, build recharge infrastructure, and dampen the regressive nature of the tax, energy independence is a few short years away.

KEYWORDS: Energy Independence, electric vehicle, homeland, national, security, oil, model, policy, gasoline, tax

**STRENGTHENING HOMELAND SECURITY THROUGH
IMPROVED FOREIGN-LANGUAGE CAPABILITY**

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Second Reader: Maiah Jaskoski, Department of National Security Affairs

In this thesis, I examine the best ways to meet post-9/11 language requirements for homeland defense and security. I look at language programs at the Federal Bureau of Investigation (FBI), the Department of State, the Department of Homeland Security (DHS), the New York Police Department (NYPD), and a federally sponsored initiative called the Language Flagship. I then examine how trained linguists reach native-like proficiency, drawing on existing studies and original research of the interpreter program at the Defense Threat Reduction Agency (DTRA). Analysis reveals that motivation, time-on-task, and immersion are the most important individual factors in attaining high-level foreign-language proficiency. In addition, organizations which utilize native or heritage speakers, conduct proficiency testing, offer language-related incentives (not to include proficiency pay), and offer regular exposure to foreign language at work, are most successful. While these factors are necessary for an organization's success, they alone are not sufficient. DTRA, NYPD, and FBI's Language Analyst programs successfully utilize foreign language capability for homeland defense and security, although each accomplishes this goal in vastly different ways. This thesis argues that expanded use of native and heritage speakers, more regular and high-level training, and expanded use of immersion, would lead to improved foreign language capability.

KEYWORDS: Homeland defense, homeland security, defense, security, linguist, linguists, interpreter, interpreters, foreign languages, foreign languages, FBI, DHS, DOS, DTRA, CASL, CDLC, Language Flagship, NSEP, national security education program, Boren scholarship, Middlebury, middlebury, immersion, language, isolation-immersion, OS, OSI, on-site inspection, language training, NPS, naval postgraduate school.

**CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR
(CBRN) TERRORISM OBSESSION PRIOR TO 9/11**

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Second Reader: Daniel Moran, Department of National Security Affairs

9/11 highlighted failures by both the intelligence and policymaking communities, and these failures were identified by the 9/11 Commission. These failures only related to the inability of the intelligence community to imagine how terrorists might use aircraft as a suicide vehicle, and how politicians failed to eliminate the al-Qaeda threat and Osama bin Laden. Completely unnoticed by the 9/11 Commission, but acknowledged by many within the academic community, was a failure of academia to understand the threat by al-Qaeda and focus too much on weapons of mass destruction terrorism. This thesis examines the question: To what extent were the academic, policymaking, and intelligence communities obsessed with chemical, biological, radiological, and nuclear (CBRN) terrorism prior to 9/11? The thesis concludes that CBRN terrorism was a concern, but was not the greatest national security threat prior to 9/11.

KEYWORDS: Chemical, Biological, Radiological, Nuclear (CBRN) terrorism; WMD

**CHINA'S GENDER IMBALANCE AND ITS IMPLICATIONS
ON CHINESE-JAPANESE AND CHINESE-TAIWANESE SECURITY RELATIONS**

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Second Reader: Michael A. Glosny, Department of National Security Affairs

The purpose of this thesis is to investigate how China's gender imbalance could affect East Asian security with respect to Chinese-Japanese relations and Chinese-Taiwanese relations. The research result is ambiguous in that China's excess males may or may not force the Chinese government to adopt a more aggressive foreign policy stance with Japan and Taiwan. On the one hand, the Chinese government has been relatively calm in its dealings with Japan and Taiwan despite the rise of Chinese nationalism. The Chinese government actively contains anti-social behaviors associated with excess males without seriously affecting bilateral relations with Japan or Taiwan. On the other hand, appealing to nationalistic fervor in order to strengthen regime legitimacy could force the Chinese government to be more belligerent. Inaction by the Chinese government in response to Japanese or Taiwanese provocation could compel many in China to engage in mass uprising against the state, thus threatening the regime's power. This thesis also provides possible options to mitigate the social and political tensions presented by these excess males and to prevent potential regional instability. Options such as war, public works projects, foreign marriage tax, population control, testosterone reduction, state-sponsored matchmaking service, and UN peacekeeping are explored.

KEYWORDS: China, Japan, Taiwan, Gender Imbalance, Excess Males, Cross-Strait, Sino-Japanese, Valerie Hudson, Andrea den Boer, China-Japan, China-Taiwan, One-Child Policy, Male Preference

**COLLABORATIVE POLICYMAKING: VERTICAL INTEGRATION
IN THE HOMELAND SECURITY ENTERPRISE**

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President Obama, the Secretary of the Department of Homeland Security and other senior federal officials have emphasized that, in order to make our country safe and resilient, all levels of government, non-governmental organizations and the private sector must all work together. This commitment to the shared responsibility requires the White House National Security Staff to make a commitment to engage meaningfully with stakeholders in the mission, through increased transparency and direct consultation. Continued engagement will not only build trust and support from those entities, but it will greatly improve the homeland security enterprise. This research set out to identify a model for the White House National Security Staff to consider using that would provide the most effective and efficient manner for the National Security Staff to engage local, state, tribal, non-governmental and private sector partners to achieve an integrated homeland security policy.

KEYWORDS: Policymaking, collaboration; integrated policy development; homeland security; federalism; HSIN; Homeland Security Council (HSC); homeland security collaboration

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